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მინისტროს განყოფილება“
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The session “Future Technologies and Drugs”
Dedicated to the 130th Anniversary of
Academician Iovel Kutateladze



Pavle Tchumburidze, Edward Aboll, Iovel Kutateladze
(From left to right)

Oral presentations

Abstracts

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Epigenetic Agents as Potentially Therapeutic Drugs for Management of Chronic Inflammatory Pain.

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Introduction:

Chronic pain affects approximately one in five adults, resulting in a greatly reduced quality of life and a higher risk of developing comorbidities such as depression. Available treatments by current drugs such as opioids and non-steroidal anti-inflammatory drugs often provide inadequate pain relief, but it is hoped that through deeper understanding of the molecular mechanisms underlying chronic pain states researchers can discover new and improved therapies. Epigenetic mechanisms, mainly DNA methylation, Histone modification may play a major role in regulating nociception. It has been established that the rostral ventromedial medulla (**RVM**) is one of the important parts of antinociceptive system of CNS.

The main goal of the present study was to investigate epigenetic regulations of pain-matrix structure of the brain as **RVM** that are involved in pain perception and pain control; it involves determination of epigenetic profile of **RVM** and study of epigenetic agents as potentially therapeutic drugs for management of chronic inflammatory pain.

Materials and Methods: All animal studies conformed to the Guidelines of International Association for the study of Pain regarding investigations. Adult rats were divided into seven groups. In first group 50 ml of 10% v/v formalin solution (Sigma-Aldrich) unilateral intraplantar injection was made. Second group was injected with saline as vehicle. 3rd-

7th groups were treated with different doses and combinations of various drugs (Xefocam, Diclofenac, ketorolac, 5-AzaC, methysergide, naloxone - Sigma-Aldrich) 30-45 min prior to pain induction with formalin. Mechanical pressure paw withdrawal thresholds were used to assess pain. The levels of DNMT1, DNMT3a and DNMT3b were measured in nuclear extracts of **RVM** neurons using DNMTs assay kits (Abcam).

Results: Received data demonstrated increased levels of DNMT3a/b in RVM neurons of rats after formalin induced pain compared with controls. NSAIDs diminished levels of DNMT3a/b in NRM, as well as 5-AzaC dose-dependantly. Prior pre injection ofnaloxone or methysergide, 5-AzaC and Xefocam did not cause decrease of DNMT3a/b.

Conclusions: Our results suggest that epigenetic regulations of certain structures of brain(**RVM**) involved in processing and modulation of painful afferentationmay be disrupted during inflammatory pain and certain substances may modify these regulations. Reduction of DNMTs with 5-AzaC and NSAIDs may be mediated via DNA methylation-dependent antinociceptive mechanisms in the RVM.Recent and our datasuggestthatepigeneticmodulators might be combined witht raditional drugs to improve analgesic effect. However, more experimental and clinical research is necessary before epigenetic modulators can be considered for the clinical treatment of pain.

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Challenges in Medical Education and Modern Technologies

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Introduction and aim: Medical curriculum is continuously changing according to the changing healthcare environment, competencies and milestones, explosion of medical knowledge, societal expectations, patient safety, ethics, need for life-long learning, and new generation of learners. Challenges facing medical education are developing in response to the use of technology.

The goals of using modern technology in medical education include facilitating perception of basic knowledge, improving problem solving and decision-making, enhancing perceptual variation, practicing for critical events, learning team training, improving psychomotor and clinical skills.

Research methodology: Randomized trials have been conducted by asking the outcome questions; statistical analysis/review of the peer-reviewed journal articles;

Outcomes: Computer-assisted learning, such as video games, podcasts and videos, mobile devices with apps and simulations and such kind of technologies are part of the nowadays techniques which meet the requirements of changing educational environment. Our review presents how the use of technologies can address different challenges in providing medical education for the future.

Conclusion: The use of technology in medical education has learning supportive function - not only to tell or show to remember, but also to involve students into the process to understand. Use of modern technologies in medical education has several advantages including enhancing perceptions, improving learning skills, standardization of instruction and assessment.

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Real-time monitoring of muscle tissue oxygenation in athletes by near-infrared spectroscopy

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Introduction and aim: Near-infrared spectroscopy (NIRS) is a non-invasive method for monitoring oxygen availability and utilization by the tissues. In intact skeletal muscle, NIRS allows semi-quantitative measurements of haemoglobin plus myoglobin oxygenation and the haemoglobin volume, via detection of changes of oxyhaemoglobin (HbO₂), deoxyhaemoglobin (HHb) and total haemoglobin simultaneously and in real-time, finally calculating muscle oxygen saturation (SmO₂) as an absolute measure of the fraction of oxygenated haemoglobin (HbO₂) present in muscle. NIRS has demonstrated utility for monitoring changes in muscle oxygenation and blood flow during submaximal and maximal exercise. On the other hand, blood lactate (BLA) and lactate threshold (LAT) plays a critical role in sports training. LAT is widely used to evaluate the sports capacity of the athletes. Considering that BLA is the product of glycolysis and that glycolysis is closely related to the supply and consumption of oxygen, changes of HbO₂, might be related with BLA. The aim of the study was the investigation of the relationship of muscle oxygenation via calculating SmO₂ measured by means of NIRS and blood lactate (BLA) in local skeletal muscle to establish desired profile of improvements and training zones for athlete.

Research methodology: We used NIRS device and BSXinsight app - leading-edge technology and athlete-based innovation to maintain appropriate to the athletes goal for

lactate threshold training. BSXinsight uses a non-invasive tissue monitoring technique - *spatially resolved near infrared spectroscopy* to measure tissue oxygenation. BSXinsight measures the balance between oxygen delivery and consumption in a given muscle or tissue directly underneath the sensor location. Exercise testing of athletes was performed on treadmill (GREEN HILL GT-304.0CA Fitness, Germany) with precise, adjustable speed. Heart beats were recorded by the Heart Rate monitor (POLAR 7, Finland), and speed was measured with O_SYNC Speed sensor (Germany).

Nine national level male endurance athletes - 6 pentathlon and 3 marathon runners, with mean age $23 \pm 4,5$ years and mean body mass index of $1,8 \pm 0,7 \text{m}^2$ participated in our study. BSXInsight sensor was centered directly over the widest portion of the calf. Incremental workload, at least 7 stage (optimal 8-10) treadmill exercise testing, 3 min each stage (increment 20 Wt), starting from 100 watts.

SmO₂, BLA, HR, VO_{2 max} parameters were simultaneously recorded. The time courses among SmO₂, BLA, and VO_{2max} were compared and analyzed.

Outcomes and conclusions: Relationship between muscle oxygen saturation changes and lactic acid concentration dynamics was revealed in all athletes. During the incremental exercise, all the athletes showed the consistence between the variation of hemodynamic changes mainly revealed by SmO₂ and BLA. Also, concentration of HbO₂ correspondingly responded to the changes of BLA as during the incremental exercise workload, increasing activity of glycolysis caused accumulation of blood lactic acid and accordingly decreased the pH value in the blood. Further broader research is required to test this explanation, explore the quantitative relationship between SmO₂, HbO₂ and BLA, which can be helpful in elaboration of training programs of athletes according their needs of profile improvements, as well as concentration on exact training zones.

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Education as the Principal Means for Socialization of the Personality

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Introduction and goal of research

Education is one of the means of the longevity, and a very important factor for social existence. Life, due to its continuing nature, requires teaching and learning that brings

education with its benefits. It enhances and diversifies the experience, and develops thinking. The transfer of knowledge is essential not only for the struggle for physical existence, but also it is important in the spheres of creative activities, science and moral. The value of a social group can be measured in alignment with how it contributes to enhancement-development of experience. For that purpose, schools were established, which provide a function of coordinating the influences accepted in the social environment. When there are the different rules in a family, in the street, or in matters of religion, the school must provide a unifying and balancing function, as well as must find the appropriate route of exposure, simplify and systematize factors that are necessary for socialization, and weed out and balance the reflex habits better than a young person would achieve independently in the upbringing. As a teacher and philosopher, John Dewey believed that training in the schools must be linked continuously with what exists out of school. The fractured link between them will render useless the school knowledge. Education is an important tool for this life, since the development of the society means the continuity of starting again something new. "Education is one of the means of this continuity, that is, the eternity of life".

Research methodology

There have been used methods of theoretical and empirical studies, observation, comparison, analysis, synthesis, induction and deduction.

Results

The school still is a special medium that is full of a specific action area, which has an impact on the intellectual and moral formation. It is one of the formal types of education, which provides understanding of such present and past threats, which cannot be realized with the casual relationships.

Applying specifically created or naturally emerged means, the school must encourage young people to understand the meaning of life – that life does not imply only the passive existence, but is accompanied by the rules of action with a number of facilitating and inhibiting conditions, and social circumstances.

The school must create the conditions for determining the rules of conduct in such a way as to make each learner participant of common endeavor, as well as an associate of the successes achieved and failures. In this case, its goals and objectives will coincide with the objectives of members of groups, and they will use the acquired fund of education and knowledge in this direction. That is why an education received in the social environment is considered to be the principal means for socialization of the personality.

Conclusion

The educational process is infinite, and it requires continuous reconstruction and transformation that supports the view that people's "life is development, and the development is life".

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Georgian Flora - a Rich Source of Medicinal Substances

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Phytochemical study of Georgian flora in order to reveal biologically active compounds was started in 50s of the last century.

The species *Astragalus galegiformis* L., *Astragalus falcatus* Lam., *Astragalus tanae* Sosn., *Astragalus borissovae* Grossh., *Astragalus microcephalus* Willd., *Akebia quinata* Decne., *Bupleurum exaltatum* M. Bieb., *Hedysarum caucasicum* Bieb., *Koeleria paniculata* Laxm., *Melilotus officinalis* (L.) Pall., *Onobrychis angustifolia* Chinth., *Phellodendron lavalleyi* Dode., *Pueraria hirsuta* Matsum., *Rhododendron ungueri* Trautv., *Satureja hortensis* L., *Trifolium hybridum* L., *Trifolium trichocephalum* Bieb., *Trifolium arvense* L. *Verbascum laxum* Filar. et Jav. were rich by content of flavonoids, phenolic acids, tannins, cycloartanes, iridoides and other biologically active substances. Structurally new compounds - flagalosides C, D (*Astragalus galegiformis*) [1] falcosides C, D (*Astragalus falcatus*) [2], (2S, 3S)-3,5-dihydroxy-2-(4'-hydroxyphenyl)-8-(3-methyl-butyl-2-enyl)-7-O-β-D-glucopyranosyl-(3→1)-O-β-D-xylopyranosyl - oxy - 2, 3, dihydrochromen - 4 - on (lavaloside, *Phellodendron lavalleyi*), 9β,19-cyclolanost-12,24E-dien-1α,3β,6α,16β,27-pentaol-27-O-β-D-(6'-O-acetoxy)-galactopyranoside (cyclotanoside, *Astragalus tanae*) [3], 6'''-O-[6-O-(4''-trans-p-methoxy-cinnamoyl-5-hydroxy-aucubigenin-(1→1')-O-β-D-galactopyranosyl] - 6'''- O - trans - p - methoxy - cinnamoyl - aucubin (laxoside, *Verbascum laxum*) [4] belong to the group of flavonoids, cycloartanes and iridoides respectively.

Purified sums of substances and individual compounds showed high antioxidant, diuretic, hypoazotemic, leukopoietic, spasmolytic, gonadotropic, hypoglycemic, cardioprotective, hepatoprotective, gastroprotective and other effects.

The methods of obtaining and analysis of active substances have been developed. The medical remedies "Flaronin" (hypoazotemic tablets), "Rodopes" (anti-herpes virus

ointment), "Saturin" (hypoglycemic capsules), "Ginkgo-bathi" (antiatheromatic tincture) were elaborated on the basis of individual compounds and active substances.

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Osteoarthritis, New Ways of Treatment with Nanoconstructs

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Introduction and aim: Joints are frequently affected by an imbalance between the breakdown and the biosynthesis of Hyaluronic Acid (HA). In case of osteoarthritis, lack of HA leads to pain and joint stiffness. To overcome the actual problem of repeated injections and fast degradation of HA treatments, a new generation of compounds are needed.

The aim of the present study was to synthesize new injectable HA hydrogels able to form spontaneously different structures by heating from room to body temperature, which would be less sensitive to enzymatic degradation and would have a long residence time at the injection site.

Research methodology: Actually, several branched polymers of pNiPAM linked to a HA backbone with appropriate linkers were synthesized, purified and characterized. Chemical, physico-chemical characterization and in vitro trials were carried out. Then, the new material was injected to mice subcutaneously and also in the joints.

Outcomes: Force-displacement measurement with a texture analyzer showed that these polymers could be easily injectable. Additionally, these hydrogels were stable in aqueous media.

Upon heating at body temperature, these polymers formed spontaneously nanoparticles. They were characterized by scanning electron microscopy, dynamic light scattering (DLS)

and nanoparticle tracking. With these three techniques, the formation of nanoparticles of 300 nm or smaller was demonstrated. By means of nanoparticle tracking analysis, the reversibility of the formation process upon cooling was shown.

The sensitivity to enzymatic degradation of the particles was assessed *in vitro* in the presence of high concentrations of hyaluronidase (55 U/mL in PBS). As assessed by DLS, at body temperature, the size of nanoparticles did not change. This is certainly due to poor enzymatic accessibility of the HA chains. This may be caused by the partially hydrophobic structure of the nanoparticles impeding the cleavage of high-molecular weight HA. In contrast, conventional HA hydrogel was cleaved rapidly in these conditions.

Biocompatibility and extended persistence of one of the new fluorescent polymers (HA Nano1) was assessed after injection to C57BL/6 mice. The biopolymers were injected subcutaneously to healthy mice or intra-articularly to osteoarthritic (OA) mice. For both types of injections, after 21 days the polymer particles were clearly visible by intravital fluorescence imaging, whereas fluorescent HA was rapidly cleared from the injection sites already after 7 days and almost disappeared after 21 days. No signs of inflammation were observed for HA Nano 1. The presence of fluorescent HA Nano 1 could still be observed on tissue sections obtained after mice sacrifice 2 months after injections.

Conclusions: This study confirmed the persistence HA Nano 1 in the joint, 2 months after the induction of OA. Compared to HA, it is less sensitive to hyaluronidase. As shown in an osteoarthritis mouse model, it has a protecting effect on the epiphysis of the medial tibia, reduces VEGF, IL-1 β , and TNF α levels/expression.

The perspectives of this study are to continue developing one of the polymers tested with the clear aim of providing a safe and efficient product for OA and skin reconstruction procedures.

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Action of L-Carnitine, Corvitin and Their Combination on Blood Biochemical Markers and Histomorphology of Liver in Experimental Model of Reye Syndrome

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Drug-induced damage of the liver belongs to the potentially life-threatening unwanted effects of the medications. Most commonly this complication is related with use of nonsteroidal anti-inflammatory drugs (NSAID), particularly administration of acetylsalicylic acid (Aspirin) in children during viral diseases (influenza B, chickenpox) can cause development of severe complication called Reye syndrome, running with rapidly

progressive encephalopathy, damage of the liver and lethal outcome in 50% of cases. Reye syndrome features deficiency of carnitine and destruction of hepatocytes. The lack of carnitine triggers disorders of mitochondrial energetic function, gluconeogenesis and synthesis of urea resulting in the development of severe toxic encephalopathy and liver insufficiency.

The goal of the research was assessment of efficacy of L-Carnitine, Corvitin and their combination on functional state of the liver in experimental model of Reye Syndrome in rats. During our research we investigated and assessed the efficacy of L-Carnitine, Corvitin and their combination in rat model of Reye syndrome. The study was performed on mature white male Wistar rats with body mass 150-180g. 50 rats were randomly divided into 5 groups (10 rats in each group). The model of Reye syndrome in rats was induced in accordance with A.Vengersky's method of intraperitoneal administration of 20mg/kg of 4-pentenoic acid (Alyllacetic acid). Toxic hepatitis was treated with intraperitoneal administration of 300mg/kg L-Carnitine or 100mg/kg Corvitin, as well as with combination of these drugs.

The efficacy of drugs was assessed with biochemical markers of hepatocytes cytolysis (ALT, AST), indicators of cholestasis (alkaline phosphatase, total and unconjugated bilirubin), glucose and urea. The histologic samples of liver tissue were stained with 10% solution of Hematoxylin and Eosin.

Monotherapy with Corvitin and L-Carnitine successfully improved liver function and equally decreased indicators of hepatocyte's cytolysis and increased levels of glucose and urea. The markers of cholestasis were slightly more improved during use of L-Carnitine. Simultaneous use of both drugs was effective in rats with Reye syndrome, indicators of liver damage normalized (markers of cytolysis and cholestasis, glucose and urea) and herewith, no mortality outcome was observed. The histology of liver corresponded to obtained biochemical data. L-Carnitine and Corvitin possess almost similar hepatoprotective activity, although their simultaneous administration totally improved histomorphology of the liver.

The most pronounced hepatoprotective effect of concurrent administration of L-Carnitine and Corvitin may be due to synergic action of these drugs and such regime can be recommended for correction of liver function during Reye syndrome.

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Solid-Phase Synthesis of Bifunctional Macrocyclic Polyamines Targeting Neurodegenerative Diseases

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Introduction and Aims

The modification of macrocyclic polyamine receptor molecules with additional ligands (arms) enables to interact with nucleobase, sugar and other biomolecules moieties for a more efficient "multipoint" recognition [1]. Cyclen derivatives showed anti-HIV and anti-malarial activities [2], as well as macrocyclic polyamines, their derivatives, and metal complexes as potential therapeutic agents in Alzheimer's disease treatment, were reported [3]. In addition, Zn^{2+} and Cu^{2+} chelators are proposed as potential therapeutic agents for Alzheimer's disease where redox reactions of metal- $A\beta$ aggregates can be inhibited by chelators [4]. On the other hand, macrocyclic polyamines such as cyclen and cyclam and their derivatives, as well as their metal complexes have wide applications in medicine [4]. Our aim was the synthesis and design of bifunctional chelators targeting both protein-protein and metal ion interactions for amyloid disaggregation and solubilization in Alzheimer's disease.

Methodology

We prepared bifunctional cyclencarboxymethyl derivatives with Fmoc- and Trt-protected dipeptides, including HisHis, GluHis and AspHis, and Dopa-substituted carboxymethylcyclen. The Fmoc group was deprotected again with 20% PIP, washed and dried. The crude products were purified by HPLC. Solvents were removed by rotovap and lyophilized to obtain colorless crystals. The new compounds were analyzed with mass-spectroscopy and their cytotoxicity was studied.

Results

The solid-phase synthesis strategy was used for preparation of new compounds. The *in vitro* testing of cytotoxicity showed that cyclen-dipeptide and Dopa hybrids are non-toxic compounds for cell line Hep G2 - ATCC[®] HB-8065[™] (cells are derived from human liver) and HEK-293T - ATCC[®] CRL-11268[™] (epithelial cells derived from kidney of human fetus).

Conclusions

The new small peptide functionalized 1,4,7,10-tetraazacyclododecan and DOPA derivatives, as well as their Cu(II) and/or Zn(II) coordination compounds were prepared. Synthesized cyclen- and DOPA-oligopeptide hybrid conjugations were purified by HPLC and analyzed using MS-ES technique. The *in vitro* testing of cytotoxicity was carried out. Interaction with amyloidic aggregates, as well as study of their antioxidant and anticancer activities are under process.

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Design and Technology of Carbamazepine Nanosystem for Intranasal Delivery

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Introduction: Epilepsy is a chronic disorder of the brain that affects people of all ages worldwide. Approximately 50 million people in the world have epilepsy, making it one of the most common neurological diseases globally. Carbamazepine (CBZ) is a lipophilic drug which shows its antiepileptic activity by inactivating sodium channels. It is on the „WHO Model List of Essential Medicines“.

Currently carbamazepine is administered only via oral route (tablets, capsules, suspensions). The drug due to its low water solubility is characterized by low and irregular gastrointestinal absorption.

Purpose: To prepare and characterize carbamazepine polymeric nanoparticles.

Experimental Methods: Carbamazepine loaded polymeric nanoparticles were prepared by a modified solvent evaporation technique. X-ray Diffractometer (XRD) analysis was performed to evaluate entrapment of drug inside the polymer. Atomic Force Microscope (AFM) was used to determine particle size and to characterize physical property of nanoparticles. Fourier Transform Infrared Spectroscopy (FTIR) was used to evaluate the drug- polymer interaction.

Results: X-ray Diffractometer (XRD) studies: diffractogram of carbamazepine was different from pure polymer and drug loaded polymeric nanoparticles while it is noticeable similarity

with physical dispersion of carbamazepine and polymer. The slight disappearance of the carbamazepine peak in the drug loaded polymeric nanoparticles indicates the entrapment of drug inside the polymer and also indicates the amorphous state of the encapsulated drug. The results showed (figure N 2;3;4;5;6), that drug entrapment was achieved for each formulation. As the results show, XRD pattern of N3 sample is different from other samples (on the diffraction pattern of N3 sample marked more peaks than on other's) which indicates that encapsulation can't be completed in case of high concentration of drug.

Atomic Force Microscope (AFM): 3D images show aggregated nanoparticles in the 1st-4th samples, indicating on instability of nanosystems. No nanoparticles' aggregation was observed in the 5th sample, thus proving the stability of nanosystem. Polymeric nanoparticles mean size for sample N5 is 30 nm.

Fourier Transform Infrared Spectroscopy (FTIR): FTIR spectrophotometric analysis results of pure active ingredient (carbamazepine), polymer and drug loaded polymeric nanoparticles indicated that no chemical interaction or changes took place during preparation of the sample N5.

Conclusion: Carbamazepine loaded polymeric nanoparticles were prepared by a modified solvent evaporation technique. It was concluded that for preparation of carbamazepine loaded polymeric nanoparticles it is better to use 1:10 drug:polymer ratio. The results show that at this ratio (sample N5) aggregation of nanoparticles does not occur, and nanosystem remains stable. Carbamazepine encapsulation was achieved in nanoparticles. It was also proved that there is no chemical interaction between drug and polymer. As well the size, shape and surface roughness of nanoparticles was determined.

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Study of Mineral Resources of Adjara (Peloids, Clays, Waters) With the Purpose of Their Application in Medical (Balneological) and Pharmaceutical Practice

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In the 21st century, the rapid growth of medicinal products nomenclature is associated with the large consumption of raw materials. Therefore, searching for new raw materials is becoming an actual issue.

Despite the diversity and abundance of mineral resources, only their insignificant part has been assimilated so far, and their subsequent research and study is one of the most topical problems for modern medicine and pharmacy.

Due to great therapeutic effect, medicinal muds, mineral waters and clays hold a special place in balneology, resort therapy and pharmacy. The history of their application starts from the ancient times.

In the available literature there is found no data on the research of the mineral resources spread in Adjara with the purpose of their application in medical and pharmaceutical practice.

The aim of the research was to study the mineral resources of Adjara with the purpose of their application in medical and pharmaceutical practices.

The chemical composition (micro- and macro-elements) of 58 peloids, 8 clays and 38 mineral waters of Adjara region have been studied using physical-chemical and modern instrumental methods of analysis;

As a result of the chemical research, the contents of balneological components have been confirmed in the study objects.

Physical-chemical and technological characteristics of clays and peloids have been studied. The possibility and advisability of their using as auxiliary substances - base carriers for soft drug formulations has been established.

The specific antibacterial action and safety of three peloids and one clay was determined on the basis of the pharmacological studies. It has been also established that the mineral water Shubani significantly stimulates the acid- and enzyme-producing function, while not affecting the peripheral blood profile. It stimulates the synthesis and release of bile acids, bilirubin secretion, cholesterol excretion with the bile, and increases a cholate-cholesterol coefficient.

Baramidze L., Tabidze D.

Engagement of the Public Health in Provision of the Future Technologies and High Standards of Life

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Management of the public health as the continuous process warrants the provision of high quality medical service. This kind of service is based upon the modern technologies - introduction of future technologies. At the same time it is appropriate to take into account an unconditional role of the patient, the recipient of the medical service as a strict and true assessor of the service.

Deriving from the existing problems in providing high quality medical service in Georgia, the Department of Public Health, Management, Policy and Health Economics set a goal to conduct a multicomponent research. It is worthy to note that the Masters (Master degree students) of the Department took active part in the research. The research was conducted in four multi-profile and one specialized clinics in Tbilisi. According to the request of the respondents the research was anonymous. The questionnaire with 15 questions was compiled and additional 5 questions were prepared for the specialized clinic. In total, 273 respondents were involved in the study 237, including both personnel and patients. An additional group was created from the patrons of the patients.

Description of the Research:

The first component of the research included the description of the high tech equipment and study of the quality of the work of professionals. The second component – proper planning of the inner/internal hospital management from the point of view of the quality of service. The third component - setting up the real picture of the satisfaction-dissatisfaction of the patients. The fourth component – the quality of the awareness of the public regarding the programs and benefits provided by the Government. The fifth component - the awareness of the public on the influence of the environmental factors on the general indicators of the health. The sixth component – the same question for all the respondents: do the given Tbilisi clinics meet international standards. The seventh component - assessment of the clinic through the 10 point evaluation system.

The outcome of the research and general conclusion:

1. Positive 65%, negative 35 %. Overall assessment 6,5-7,0 points.
2. The research shows that there are positive tendencies; however there are some problems and overcoming them needs joint efforts.
3. There is a need to raise awareness of the public through press, TV, Mass-media, advertisements etc.
4. More attention should be paid to the environmental health and health prevention.

5. There is a necessity to bring into compliance use of high technologies with the life and high quality of the service.

Conclusion – provision of future technologies and high quality of life represent the basis and guaranty for the high quality medical service.

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Importance of Pharmaceutical Regulations to Assure the Quality of Healthcare System and Life

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Medicines are not ordinary consumers' products. In most instances, consumers are not in a position to make decisions about when to use drugs, which medicines to use, how to use them and to weigh potential benefits against risks as no medicine is completely safe. Professional advice from either prescribers or dispensers are needed in making these decisions. However, even healthcare professionals (medical doctors, pharmacists) nowadays are not in capacity to take informed decisions about all aspects of medicines without special training and access to necessary information. The production of medicines, their distribution and dispensing requires special knowledge and expertise. Moreover, only basic training in pharmacy may not enable to take proper judgments about medicines quality. Low quality, ineffectiveness and unsafety of the medicines also effects on reputation of health systems, health professionals, pharmaceutical manufacturers and distributors. Finances spent on less effective, unsafe and poor quality medicines is wasted – whether by patients/consumers or insurance schemes/governments. Governments have the responsibility to protect their citizens in the areas where the citizens themselves are not able to do so. Thus, Governments need to establish strong national regulatory authorities (NRAs) to ensure that the manufacture, Quality control, trade and use of medicines are regulated effectively. In broad terms, the mission of NRAs is to protect and promote public health.

However, not only Governments are interested in development of the system, which gives the opportunity to decrease risk connected with drug use. Commercial structures are ready to create a strong regulatory system with appropriate pharmacovigilance monitoring.

Pharmacovigilance is one of the most important tool of the pharmaceutical regulation, which gives the opportunity to minimize the risk of the product side effects. With first look,

it is thing, which may cause the problem with commercial point of view, but in reality, it is the helpful system to protect the company from unexpected results of the drug usage.

Georgia is at the beginning of the development of such system.

Company GEPHA JSC set the goal to create the strong regulation system with well-trained professionals: several SOPs were created and validated. At present, in this system is included the pharmacists from pharmacies of the chain and medical representatives of the company to collect the information about some undescribed or even listed side effects in Patient Information Leaflet from customers, doctors, publications and social media. Along other obligations, the person involved in pharmacovigilance monitoring should inform not only physicians but also patients to be careful and do not hesitate to contact their doctor(s) or pharmacist(s). The created system guarantees 24/7 hot line for any kind information from any person.

Company GEPHA JSC, the new subject on the Georgian Pharmaceutical Market and we are sure that developed pharmaceutical regulation, storage and distribution systems with appropriate pharmacovigilance monitoring, is an important step to the safer future also from commercial point of view: as well-informed patient believes in company.

Barbakadze V., Gogilashvili L., Amiranashvili L., Merlani M.

Methylated Poly[3-(3,4-Dihydroxyphenyl)Glyceric Acid] from *Anchusa italica* Retz. and *Symphytum grandiflorum* DC (Boraginaceae)

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According to data of IR, ^1H NMR, ^{13}C NMR, gCOSY and 2D heteronuclear $^1\text{H}/^{13}\text{C}$ gHSQCED experiments caffeic acid-derived polymer, namely poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA) was detected in water-soluble high-molecular preparation of *Anchusa italiaca* (HMP-AI) and *Symphytum grandiflorum* (HMP-SG) by analogy with *S. asperum*, *S. caucasicum* and *S.officinale* high-molecular preparations. 2D heteronuclear $^1\text{H}/^{13}\text{C}$ gHSQCED spectrum of HMP-SG exhibited the following correlation between proton and carbon atom 4.2/56 ppm, which confirmed the presence of methoxy groups in carboxylic acid methyl esters. In contrast to polymers of other species of *Symphytum*, most of the carboxylic groups of PDPGA from *S.grandiflorum* and *A.italica* are methylated. The 2D DOSY experiment gave similar diffusion coefficients for the methylated and non-

methylated PDPGA signals of *S.grandiflorum* and *A.italica*. Both sets of signals fell in the same horizontal. This would imply a similar (same order of magnitude) molecular weight for methylated and non-methylated PDPGA of *S.grandiflorum* and *A.italica*. Thus, we conclude that the NMR signals of both methylated and non-methylated carboxylic groups originate from the same poly[3-(3,4-dihydroxy-phenyl) glyceric acid] polymer. PDPGA of *A.italica* exhibited antioxidant activity against the relatively stable 2,2-diphenyl-1-picrylhydrazyl radical (DPPH^{*}). IC₅₀ value of *A.italica* PDPGA was 51.5µg/ml ± 1.11 µg/ml (n=4).

Bidzinashvili R.

Medicinal Plants of Georgia as Base for Future Technologies, their Protection and Rational Use

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Global research conducted by the World Health Organization (WHO / TRM) with the purpose to regulate folk and alternative medicine and herbal medicines, ascertains that many countries do not only import but also produce large quantities of herbal medicines and their number on the European market is gradually increasing. From 100,000 medicines that are used in the practical world medicine, plant preparations make more than 30%. At the same time, the constant increase of the production of medicinal plants in the wild, unsustainable and excessive exploitation that often occurs in the same natural areas is a real threat to the complete destruction of these species.

In this respect some endemic species of Georgia and Caucasus, which are used in the officinal medicine (*Atropa caucasica* Kreyer, *Berberis iberica* Stev. & Fisch. ex DC., *Betonica abchasica* (Bornm.) Chinth., *Dioscorea caucasica* Lipsky, *Colchicum speciosum* Stev, *Convallaria transcaucasica* Utkin ex Grossh., *Gymnospermium smirnowii* Trautv.) Takht., *Galanthus krasnovii* A. Khokhr., *G. woronowii* Losinsk., *G. lagodechianus* Kem.-Nath., *G. platyphyllus* Traub & Moldenke, *Helleborus abchasicus* A. Br., *H. caucasicus* A. Br., *Helichrysum polyphyllum* Ledeb., *Paeonia caucasica* (Schipcz.) Schipcz. *P. carthalinica* Ketzch, *Pimpinella aromatica* Bieb., *P. schatilensis* Otschiauri, *P. idea* Takht., *Pyrethrum carneum* Bieb., *Rubia transcaucasica* Grossh., *Salvia garedji* Troitzk., *Satureja bzybica* Woronow, *Senecio rhombifolius* (Adams) Sch. Bip. , *S. platyphyloides* Somm. & Levier, *Symphytum caucasicum* Bieb. *S. grandiflorum* DC., *Taraxacum praticola* Schschk , *T. confusum* Schschk , *Thymus ladjanuricus* Kem.-Nath., *T. caucasicus* Willd. ex Ronn.,

Valeriana tiliifolia Troitzk., *V. colchica* Utkin. etc.) and produced annually by local or foreign firms in large quantities often provokes reduction of the populations or even destruction of these species.

With regard to the increased use of the medicinal plant resources the question of their protection and rational use becomes to be more imperative. At present, the extensive use of the resources of the medicinal plants growing wild should be changed by scientific system, which provides reproduction of utilized cenoses, study the reasons for reduction of raw materials (the total biomass, as well as chemical contents), determine the terms from exploitation until perfection of a certain cenosis, impact of erosion quality and so on. It is also necessary to determine their cenotic optimums, establish the exploitation periodicity and define the time required for the restoration of the community. Before the production of raw materials in the virgin cenoses is started a complete geobotanical description should be carried out, the number and biomass of the preparatory plants should be registered and on the basis of the results the time of exploitation and potentials will be determined. With the purpose to reveal productive and rapidly restoring cenoses the geographical and ecological optimum of the species should be precisely defined. Particular attention should be paid to the phytocenological status of cenosis; its succession should be taken into consideration so that the exploitation does not cause rapid change of the censosis, destruction of species and populations. While purveying the raw materials the biotopes of rocky slopes (the plants in the extreme boundaries of geographical distribution) should be treated with much care and prevent preparation of raw materials in small and weak populations.

Proceeding from the strategic measures of protection that comprise *in-situ* and *ex-situ* conservation of floristic diversity, their intensification and sustainable use in natural ecosystems, it is necessary to cultivate the plants from this group and create appropriate plantations that will be an important base for creating future technologies.

It should also be mentioned that each species growing around us has the unique gene pool created during the evolution process as a result of natural selection. All of them have a potential economic value but it is impossible to predict which species can be useful or irreplaceable. The possibilities to use the species are so inestimable that it would be a great mistake to let a species disappear just because we do not know its usefulness properties.

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First Aid Tools and Procedures in Higher Educational Institutions

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Introduction. The work deals with the maintenance and effectiveness of first aid tools in higher educational institutions. The problem is significant and occurs in almost every higher educational institution of Georgia.

The aim of the research lies in the following “Can students and staff give emergency first aid to a sick or injured person?” „Is it enough to exist a person in higher educational institutions who is responsible for providing? Or does she/he own a first-aid kit (medicines, medical equipment) in case of necessity of giving first assistance before arriving the ambulance service? These are the key questions and the answers are presented in the work as a result of study.

Methodology- the work is based on the research that covers qualitative and quantitative methods. Through the process of studying the following instruments have been used: a table research, questionnaire, detailed interview and the analysis of supplementary data. The research has been employed in different higher educational institutions of Georgia.

Results. The law about higher education and in accordance with the order 99/ of “Georgian Minister of Education and Science of supporting authorization regulation and fee” defines that higher educational institutions must pass the authorization procedure and satisfy the crucial standards to accomplish proper activities. One of the standards is material resource including the following requirement: “in order to keep the safety and protect the health of students and staff, first aid mechanisms must exist in any higher educational institutions. In case of not meeting one of the standards, authorization board makes a decision about rejection. Consequently, higher educational institutions must have mechanisms for first aid maintenance, doctor/nurse or a qualified person assigned on the basis of the order and first-aid tools (medicines, medical equipment), to give immediate first aid before arriving the ambulance service.

In the authorized higher educational institutions of Georgia, a doctor’s room is equipped with medications necessary for first aid. In higher educational institutions medical person is employed – a doctor who provides first aid. The above mentioned people’s functions are determined in their work description and the establishment or higher educational institution takes care of purchasing/updating the proper equipment.

Conclusion. The research has shown that first aid mechanisms and procedures in higher educational institutions of Georgia correspond to the standards of authorization. However, another problem was revealed: the majority of students and staff are not informed about the above mentioned procedures and mechanisms. They do not have first aid skills to use

in emergency. At universities the number of qualified medical people is not enough too. In order to protect the safety and health of staff and students it is highly recommended to allot more human or material resources, to make a schedule of the people who are in charge of fulfilling duties, to publish contact information on the university website and lobby. The doctor has to conduct training (usually at the beginning of the year) about the process of giving first aid at every faculty.

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Relationship Between Genetic Polymorphisms of Drug Efflux Transporter MDR1 (ABCB1) and Response to Losartan in Hypertension Patients

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Objective: Losartan is a selective angiotensin II receptor type 1 blocker and a substrate of drug efflux transporter *MDR1* (ABCB1). *MDR1* shows interindividual variations due to genetic polymorphisms. *C3435T*, *G2677T* and *C1236T* polymorphic alleles of the *MDR1* gene encoding the transporter have been shown to alter the transport, bioavailability and efficacy of certain drugs. The purpose of this study was to investigate the relationship between genetic polymorphisms of *MDR1* (*C3435T*, *G2677T/A* and *C1236T*) and response to the treatment in newly diagnosed hypertensive patients being treated with losartan.

Patients and methods: A total of 74 newly diagnosed hypertension patients were included in the study. Genotyping was performed using PCR-RFLP. Systolic and diastolic mean blood pressure changes of the patients were expressed as a percentage (\pm SD). Blood pressure values prior to initiation of the treatment and subsequent measurements 6 weeks after starting the treatment were compared.

Results: Regarding the *C3435T* polymorphism, a mean decrease of systolic blood pressure in individuals with *CT* or *TT* genotype (n= 55; 11.6% \pm 9.7 mmHg) was significantly higher compared with that of the *CC* genotype (n = 19; 6.7% \pm 9.6 mmHg, $p = 0.03$). No significant systolic blood pressure changes observed in *G2677T/A* and *C1236T* genotypes ($p = 0.13$ and 0.07, respectively). There was not any significant difference in diastolic blood pressure changes between pre- and post-treatment for any of the genotypes with *C3435T*, *G2677T/A*, or *C1236T* variations.

Conclusions: This study revealed that hypotensive response to losartan was significantly affected by the C3435T genetic polymorphism of MDR1 and hypertensive patients with MDR1 3435T allele may present a better response to losartan treatment.

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Creating Bioactive Bone Composite for the Reconstruction of Large Size Mandible Bone Defect

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Introduction and aim. Three-dimensional reconstruction of the large size defects of the mandible bone following injury or tumor resection is one of the most challenging procedures in maxillofacial surgery. Various types of bone materials can be used as grafts for reconstruction of mandibular bone defect: auto, allo, xeno and alloplastic bones. Autogenous bone is still considered the gold standard for maxillofacial surgery since it has optimal osteoinductive, osteoconductive and osseointegration properties; however, harvesting of autologous bone graft is associated with morbidity and a number of complications. Also, autologous bone graft may be subjected to resorption.

Research methodology. The aim of the present investigation was to develop a novel biologically active bone graft, and to use it for the reconstruction of large size defects of the mandible bone following injury or tumor resection. Biologically active bone graft was developed by using rat freeze-dried bone marrow stem cells paracrine factors and three-dimensional bone scaffold derived from cancellous bovine bone following decellularization. Sodium dodecyl sulfate and 1% Triton X-100 for decellularization of bovine bone, and 4% sodium hypochlorite for deactivation of prions were used. Bilateral critical mandibular defects were created in twenty Lewis Inbred rats. Defects of the right side of the mandibles were reconstructed with the cell–scaffold construct in all animals. All left mandibular defects were left untreated and served as blank controls.

Outcomes. The studies have demonstrated that a biologically active graft containing freeze-dried bone marrow stem cells paracrine factors may be used for the reconstruction of critical size mandibular bone defects.

Conclusion. Biologically active graft that contains freeze-dried bone marrow stem cells paracrine factors can be used as a good alternative for bone regeneration.

Chaidze F.

Ex-Situ Conservation of Medicinal Species of Magnolia Genus Introduced to the Batumi Botanical Garden

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Botanical gardens serve the global strategy for conservation of the plants.

Our aim is to develop targeted introduction of the plants, *ex situ* conservation of newly introduced species, study of bio-ecological characteristics, identifying perspective itroducent sand defining their application ways under the conditions of Adjara Black Sea coastline, which was created at the edge of XIX-XX centuries. Batumi Botanical Garden and its century-long history of existence serves as an excellent example for this.

For studying morphological and rhythmic peculiarities of the plants the methods by I. Serebriakov and I. Beidermann, as well as phenological observations, were conducted by applying the method acceptable for the Botanical Gardens.

The problem is of actual importance, as the directions and approaches for application of introduced species has not been studied from this viewpoint. For successful introduction it is necessary to pay attention to the issue of usefulness of the species to be introduced and to forecast their introduction.

Plants serve as a continuous source for energy source of biologically active substances, whereas their study and application serves as a genuine treasure for pharmaceutical chemistry and chemical-pharmaceutical industry.

On the basis of conducted introductive research, while studying morphological peculiarities of separate species, during vegetation period a particular focus was attached to the peculiarities of seasonal growth and development, reproduction issues, terms of separate pheno-phases, relaxation period, winter durability and sustainability towards parasite diseases.

Four medicinal species of Magnolia family conserved as the result of introductory activity at Batumi Botanical Garden are represented in the article: *Magnolia officinalis* Rehd. et Wils., *Magnolia grandiflora* L., *Magnolia glauca* L., *Magnolia denudata* Desr. The species studied by us can be given honorable place in the modern medicine and pharmacy from the

viewpoint of their application. Complex researches, defining the level of adaptation in Adjara coastline and under introduction conditions upon biological peculiarities of perspective plants showed that Batumi Botanical Garden is a real base for genetic resources of the medicinal plants. By applying this foundation on the basis of forming large introduced populations, it is possible to ensure rational exploitation of the above mentioned species as raw material for pharmacy and medicine.

Cheishvili J.

The measurement of efficiency and productivity of health care delivery in Georgia

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Background. The social-economical crisis during the last decade in Georgia has been initiated by several wars, increasing number of refugees, unemployment, and emigrants – defined as the negatively influence on the population of Georgia. According to figures published by the UNDP the population will decrease twice by the year 2050, which may result in significant population loss (United Nations, 2015). The research questions are Analysing of the delivery system and assessment of the regulations about delivery through the country.

Methods. The study was mix-method investigation using cross-sectional survey design. The research was conducted in two population areas - largest and smallest ones. 10% of the total population of each area was selected for the study. Participants shared such characteristics as socioeconomic status, educational background and ethnicity. Sampling method was the stratified sampling technique, randomly applied to target group. Respondents were aged between 18 and 65 years. The ethical approval was granted from Tbilisi State Medical University's Ethics Committee. Data was collected from January 2017 to April 2017. The data was analysed using the SPSS v.23 software.

Results. 780 respondents participated in the survey. 62.8% of the respondents were in their youthful age less than 45 years. The data were analysed using descriptive statistics. Most of respondents were Georgians by nationality, Orthodox Christians. There is a lack of information on birthrate tendency through the country, which reflects on attitude of demography through the country.

The survey revealed that Georgian people are not happy with the regulations and legislations from the viewpoint of birth promotion. In the country that faces the demographic collapse, women must have at least three children, and increase in caesareans is the main factor of birthrate decrease.

Conclusion. When making decision on birth type, women and their relatives prefer caesarean, which correlates with infertility rate and worsens maternal and child health. It is survival to establish some supporting groups or organisations to encourage new generation for marriage and having big family.

Chutkerashvili K., Kakabadze Z., Chutkerashvili G., Chakhunashvili D., Karalashvili L.

Novel Biological Graft for Dura Repair in an Ovine Model: A Pilot Study

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Introduction and aim. Cerebrospinal fluid (CSF) leakage is one of the intractable complications of neurosurgery and spinal surgery. Possible sequelae of CSF leaks include bacterial meningitis, delayed wound healing, airway obstruction, cutaneous CSF fistula, and pseudomeningocele. We hypothesized, that the decellularized human amniotic membrane with the freeze-dried bone marrow stem cell paracrine factors can be used to close the defect of the dura mater arising after trauma or excising during intracranial or spinal surgery.

Research methodology. This preclinical study was performed on 10 adult domestic sheep of Turkish breed that were obtained from sheep-breeding farm Marneuli (Georgia). All animals were in the weight range of 14-18 kg at the time of receipt and were enrolled into the study. Right craniotomy has been performed over the frontoparietal area in all animals. Afterwards, the bone was removed with great care to prevent injury to the dura and arachnoid maters. Dura mater was cut out creating the defect with size of 3x4 cm. The defect was covered with decellularized human amniotic membrane with the freeze-dried bone marrow stem cell paracrine factors. The bone defect was then closed with bone fragment and aponeurosis. For the assessment and detection of CSF leakage, brain inflammation, brain lesions and graft visualization the computed tomography (CT) scans with and without contrast were performed at the scheduled dates. Neuroimaging was performed on the 2nd, 4th and 8th weeks after surgery. For morphological studies, the bone, dura mater, graft, brain and tissues surrounding the defect were resected and fixed

in 10% formalin solution. Sections were stained with hematoxylin-eosin and Masson Trichrome.

Outcomes. External wounds were successfully closed without any macroscopic evidence of inflammatory and infectious processes in the soft tissues of all animals. CSF leakage was not observed. Brain tissue itself looked normal, without inflammatory changes on cerebral surfaces. After 1 month, inflammatory processes have decreased and new blood vessels were formed.

Conclusion. Decellularized human amniotic membrane with the freeze-dried bone marrow stem cell paracrine factors represents a biocompatible, non-toxic and hypoallergenic three-dimensional scaffold and fits the criteria of an ideal dura mater substitute.

Dateshidze L. A.

About High Potent Efficacy of FLEBIL in Pharmacotherapy of Hemorrhoidal Disease Associated with Irritable Bowel Syndrome

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Introduction and Purpose

FLEBIL (manufactured by AVERSI-RATIONAL) contains considerable amounts of plants extracts (*Cissus quadrangularis*, *Aesculus hippocastanum*, *Vitis vinifera*, *Matricaria recutita*, *Calendula officinalis*) determining its vasotropic effect, and is indicated for pharmacotherapy of hemorrhoids. Although there is a substantial expectation that FLEBIL's compounds are effective for other gastrointestinal disorders associated with hemorrhoidal disease. Such condition can be irritable bowel syndrome (IBS), whereas reasons and symptoms of these two conditions are tightly relevant to each other. The purpose of this work was to find logical basis for the mentioned expectation.

Methodology

The study conducted by Chinese scientists (Lei Zhang, Jun Song, Tao Bai, Wei Qian and Xiao-Hua Hou), that explains pathophysiological mechanism of stress induced IBS, was analyzed. The study showed mast cells' role in the intestinal dysfunction of IBS. Therefore mast cells stabilization is expected as a target therapeutic effect for IBS pharmacotherapy.

On the other hand, study of Irish scientists (D. F. Finn and J. J. Walsh) on mast cells' natural stabilizers for different mast cells populations, showed mast cells' potent

stabilizing features of flavonoids, phenols, terpenoides, coumarins. Especially, quercetin, miricetin, rutin, fisetin, kaempferol are remarkable in this respect and they are active compounds of FLEBIL.

Results

By integration of IBS pathophysiology mechanism, showing the importance of mast cell stabilization and natural mast cells stabilization potency of FLEBIL's compounds, FLEBIL can be argued as a high potent pharmacotherapeutic remedy for hemorrhoidal disease associated with IBS. Consequently, it is possible to have bilateral efficacy – as a vasotropic (against hemorrhoidal disease) and as a regulator of gut dysfunction (against IBS).

Conclusion

Thereby, in case of clinical confirmation, use of FLEBIL in pharmacotherapy of hemorrhoidal disease associated with IBS, will provide bilateral efficacy, and moreover, avoid polypragmasia risks and reduce therapy costs.

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Health education in school

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Health literacy is one of the most important aspects of human life. Life quality of individuals or society is closely linked to health literacy. To have health literacy means that the person has healthy behaviors and is able to make educated health decisions. These qualities make an individual the productive member of community. People are more healthy, happy and successful. This factor has a positive impact on economics and life quality of society. Therefore, educating people about health is essential for well-being of both individuals and society and it is a matter of national importance in each country. To be health educated is a way to being better citizen and happier in life.

Health education is a lifelong process of imparting health related knowledge and attitudes and developing health related skills but it is of great importance that education about health start at early stages of human life. It is more effective and easier to form proper attitudes and behavior in childhood than improve unhealthy habits of adults.

The most effective way to promote health enhanced knowledge and behavior in population is to ensure quality health education in schools. People attend school for 5-6 hours a day

up to 10 years of critical physical, psychological, intellectual and social development. Therefore, schools can play vital role in establishing health literacy in society. It is actual that every person be aware from childhood that things like a person's activities, natural or work environment and diet impact health. In school programs, children must be introduced with variety of health themes: nutrition, physical growth and development, reproduction, mental health, drug and alcohol consume safety. Health education may reduce health risk behaviors such as smoking, alcohol and drug use among teenagers and promote health enhancing behavior such as healthy nutrition and participating in physical activities. Health education has positive impact on learning of other subjects as well. Healthy pupils have higher attendance and better grades.

In Georgian society, the importance of health education for children often is underestimated. Such themes as puberty or reproduction are considered improper/indecent. Many parents are interested only in the academic education of their children and do not pay attention to adopting healthy behavior, even they do not wish that their children were engaged in physical activities.

In Georgian school, curriculum health education is not represented as a separate subject. These items are only shortly discussed as a part of a civic education in the ninth grade. Health education of course is the essential component of civic education but this is not enough and needs to be expanded in order to achieve better results in bringing up healthier generation. These topics can be studied as a separate subject in a group of social studies as well.

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The Association Between MTHFR C677T Polymorphism and Arterial Thrombosis

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Introduction and objective: Arterial and venous thrombosis disorders continue to be a leading cause of global mortality and morbidity [1]. Due to the lack of information about the association between inherited thrombophilias and arterial thrombosis in Georgia, we aimed to evaluate the association between MTHFR C677T gene and arterial thrombosis in Adjarian (Georgia) arterial thrombosis patients and control groups.

Materials and methods: This study involved 214 individuals, 101 arterial thrombosis patients (71.3% are males; 66.3 +/- 12.1 years old) and 113 healthy control subjects. Blood samples were collected at the Heart Disease Department and Medical Ward of Batumi Hospital, Government of Autonomous Republic of Adjara, Georgia. The samples were subsequently processed at the Faculty of Pharmacy, University of Porto. The genomic DNA was extracted from a dry blood spot on Whatman filter paper according to the instructions from the KAPA Express Extract Kit (KAPA Biosystems, Wilmington, MA, USA). The polymerase chain reaction (PCR) was performed to detect the polymorphism of the MTHFR (C677T) gene as described previously [2]. The amplification products were analyzed by electrophoresis in 2% agarose gel with ethidium bromide. Standard troponin measurements and computed tomography (CT) scans were used for the diagnosis of patients with myocardial infarction (MI) and ischemic stroke.

Results: Genotype frequency was 8.9% in patients and 3.5 % in the control group.

Conclusion: MTHFR gene mutation might increase the risk of arterial thrombosis because of the high frequency MTHFR C677T polymorphism found in arterial thrombosis patients.

Keywords: MTHFR C677T gene; Polymorphism, Arterial thrombosis; Georgia.

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Synthesis and Biological Evaluation of Novel Substituted 2-[(5-Adamantane-1-Yl) 1,3,4-Thiadiazol-2-Yl] Imino]-5 Thiazolidinones

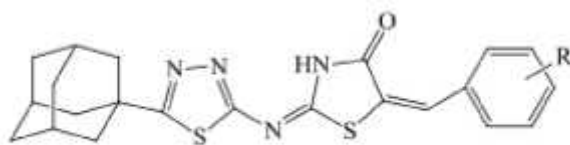
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Throughout the human history, there has been a real struggle between human and various microorganisms, which cause infections. Around the middle of the 20th century, the progress of antimicrobial agents was great and the winner of that struggle proved to be the human [1]. The frequent and bad use of the antibacterial and antifungal drugs led to the wide phenomenon of the bacterial and fungal resistance [2]. Usually, the infections are accompanied with inflammation, so, the researchers try to design and synthesize agents with dual action, both antimicrobial and antiinflammatory activity, in order to avoid burdening the patient with multiple medications.

The thiadiazole moiety has been connected -among others- to antimicrobial and antiinflammatory activity and the adamantane core has received considerable attention due to its wide range of pharmacological action.

So, this work presents the design, synthesis and biological evaluation of novel thiadiazole derivatives (Scheme 1). Following the prediction of several compounds' biological activity by the program PASS, seventeen novel compounds were selected and synthesized. The synthesis of the final compounds was carried out in 4 steps. In the final step, condensation between the intermediate thiazolidinones and different aromatic aldehydes took place, with high yield (39.1-74.7%). All the compounds are tested for their antibacterial, antifungal and antiinflammatory activity. Results will be presented.



Scheme 1.

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Results of Combined Use of Antioxidants of Mineral and Floral Origin During Dyslipidemia

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Basic clinical goal for the management of dyslipidemia is timely prevention of atherosclerosis process and cardiovascular complications related to it. The purpose of our research is to study combined action of Dioscoridi and Geomin Forte that are medicines of antioxidant activity, in patients with dyslipidemia.

We have carried out ambulatory monitoring on 32 patient with hyperlipidemia (28 men and 4 women), whose age ranged from 34 to 87 years. Each of them was diagnosed with high levels of cholesterol and triglycerides at the same time. We have been conducting antioxidant treatment with combined application of Dioscoridi (300mg), medicine of floral origin, and Geomin Forte (500mg) of mineral origin, biologically active additive (BAA) during one month within optimal dose. In particular, the mentioned group took Dioscoridi and Geomin Forte as one capsule three times per day.

As a result of conducted antilipid therapy, total cholesterol returned to normal level in 16 patients from 32 (50%); as for the increased level of low density lipoprotein (LDL), it has been reduced till upper limit of norm in 4 (12%) cases. At the same time the rise of high density lipoprotein (HDL) content appeared in same patients. Only 8 (25%) showed insignificant decrease from high level triglycerides.

Therefore, the results of our research allow us to conclude the following:

- The combined use of Dioskoride and Geomin Forte, medications with antioxidant activity, during thirty days in therapeutic dose, to some extent, improves lipid profile;
- Due to natural structure of Dioskoride and Geomin Forte, they can be applied in combined use for a longer period of time, which increases itself the efficiency of medications in terms of anti-lipid activity;
- If we consider undesirable ecological situational sharp increase of psycho-emotional tension conditioned by the civilization from current viewpoint, which creates grounds for the progression of atherosclerosis processes, shows perspective for inevitable application of antioxidants equipped by the ability to act on the cellular level in the issue of medical treatment and prevention of harmful disease.

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Problems of Pharmaceutical Work Law in Georgia.

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Quality of the individual human life significantly depends on his health, which is in direct connection with the quality of healthcare system in the country and also with the normative basis of the law which regulates this system.

Subject of the study was the Georgian law of "Drugs and pharmaceutical activity" (hereinafter referred to as the Act), based on the 2009 edition, which is a pharmaceutical product flow of legitimate practice in the provision of legal bases. And the goal was to identify the shortcomings in the law that prevent the implementation of the declared policy, goals and objectives in the field of circulation of pharmaceutical products. The method of comparative analysis was used as a method of research.

As a result of the study, it has been established that in the part of definitions of the terminology in law there is no definition of the word "medicine". The division of pharmaceutical products into groups (Article 112) is vague and does not allow the definite distinction of pharmaceutical products belonging to the 2nd and 3rd groups.

In the part of realization of the pharmaceutical product (Chapter VI, Article 16), the entities carrying out the retail realization are individually, but there is nothing to say about the subjects engaged in wholesale sales.

Retail realization of pharmaceutical products (Excluding specially controlled products) and the Pharmaceutical work permission itself is given to the independently working medical personnel based in villages and small settlements (Article 16, P. 1, 4), whose knowledge and qualification can't meet the level of needs that is set by the law in the sphere of pharmaceutical turnover (Article 2), as well as the relevant practice of keeping the pharmaceutical product "GSP" to the Guidelines provided by the World Health Organization (Article 3). For the same reason, it is impossible to fulfill the requirements in the part of the requirements for the pharmaceutical product seller (Article 17, P9), as well as the preservation of pharmaceutical products and the issues related to the pharmaceutical consultation (Article 17, p.3, 4).

In the part of the requirements for pharmaceutical products seller (article 17, p.7), the requirements of the realization of pharmaceutical products belonging to the third group are not defined at all, which also excludes the performance of declared state policy in the field of circulation of pharmaceutical products.

According to the surveys, the implementation of the state policy declared by the law in the area of circulation of pharmaceutical products is necessary to further enhance the law and to bring the objectives of education policy to the subjects engaged in pharmaceutical activities.

As the **result**: according to the surveys, the implementation of the state policy declared by the law in the area of circulation of pharmaceutical products is necessary to further enhance the law and to bring the objectives of education policy to the subjects engaged in pharmaceutical activities.

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School and Learning-Upbringing Issues of Health Oriented Students

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Health is the most important treasure of humanity on which depends humans' life, working and acting ability. Health is very much linked to education. Nowadays, in a stressing and harmful environment, thinking and acting in favor of improving health conditions of children is becoming more and more important. The school has a special function in relation to children's health care. Arrangement of school environment and educational processes with consideration of children health care in accordance with hygiene norms are crucial in teaching and learning processes. At the same time, arrangement of learning environment in compliance with hygiene norms and permanent reminding for children about how and when things should be done are not enough. It is necessary that children have information about hygiene in environment, mental and physical labor, food, leisure, sleep and other everyday activities; have a habit to act using hygienic standards and norms; know about results of harmful habits on health, importance of health lifestyle and its rules. Acquiring skills and knowledge of hygiene standards will contribute to the conscious action of children and protection of their healthcare.

All the above mentioned proves that arrangement of environment and educational processes in compliance with hygiene standards, study of level and quality of competence of school staff, find ways to overcome gaps and barriers, determination of importance and principles of hygiene education are issues that becoming more and more crucial.

The above mentioned is used as a basis for research. It proves necessity and means for implementing hygiene requirements of environment and educational processes, teaching of school managers, teachers and students in specific subjects of hygiene, arrangement of environment and educational processes in compliance with hygiene norms by school doctors, arrangement of provision of healthy food, provision of medical-prophylactic learning for school staff and parents as well as capacity building in planning and implementing healthcare activities. Taking into consideration all above mentioned will significantly contribute to the raising of healthy generation caring for their and others health.

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Preparation and Employment of the Functional Hybrid Nanomaterials on the Metal-Organic Framework (MOF) Basis

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Drug delivery comprises fine-tuning physical–chemical properties of pharmaceutical ingredients, targeted delivery to the proper site of action, control of drug release kinetics, and design of drug formulations. Challenge present in the pharmaceutical industry is to control the drug release in order to acquire the optimum therapeutic efficacy. The release kinetics of a drug depends on many factors: drug loading levels, in-process parameters, and formulation techniques. Many materials have been proposed and studied as drug delivery carriers in the past decade. Traditional drug delivery materials can be classified into organic and inorganic Drug Delivery Systems (DDSs) . Organic DDSs such as polymeric systems and liposome-based systems normally have good biocompatibility but often boast no controlled release in the absence of a well-defined porosity. While inorganic DDS materials such as microporous zeolites, mesoporous silicon and layered double hydroxide (LDH) are able to release drug molecules in a controlled manner, their applications in drug delivery are often restricted by their limited loading capacity] and they suffer from cytotoxicity.

Metal-organic frameworks (MOFs), are a new class of materials composed of transition metal ions/clusters and multidentate organic ligands or linkers. MOFs are often referred as hybrid inorganic–organic materials. Many typical properties of inorganic materials such as magnetic, electronic and thermal properties are derived from transition metals; and organic ligands contribute to the biocompatibility and polymer properties. The great potential of using MOFs as DDSs largely relies on a number of factors: (1) high surface area and exceptional porosity; (2) low toxicity of a number of metal ions, i.e. Fe, Zn; (3) good physical and chemical stability; and (4) highly tunable and well-defined structure and chemical compositions. Noteworthy series of MOFs have recently been reported, exhibiting a wide variety of topologies and compositions, high adsorption capacity and biocompatibility. There are three routes for the drug uptake into MOFs: (1) adsorption; (2) acting as ligands; (3) post-synthetic modifications.

The aim of the present work is to study the impact of the characteristic features of MOFs materials, i.e. the chemical functionality of the framework building blocks (organic linkers and metal ions) and porous structure on their potential as the DDS. In order to achieve this goal, we synthesized the representative set of biocompatible MOFs structures with phenylenedicarboxylate and imidazolate linkers and Zn^{2+} , Fe^{3+} and Mg^{2+} ions. Our methodology is to use the post-synthetic modification (*via* adsorption) of previously synthesized MOFs samples with open porous structure by drugs like aspirin and caffeine. Another approach used in this study is the synthesis of nanoscale DDSs. Scaling down MOFs materials to nanoparticles allows us to formulate them by optimal way for intravenous or oral administration. We used MW-assisted synthesis as most effective route for MOFs nanoparticles preparation. For this, the original procedures realized at moderate temperature and atmospheric pressure were developed. The synthesized DDSs based on metal-organic frameworks were studied by a combination of physico-chemical methods: XRD, SEM and N_2 adsorption.

Thus, the possibility of MOFs materials usage as DDSs depends strongly on the accessibility of pore voids and biocompatibility of organic linkers and metal ions in the frameworks. MW-assisted synthesis under mild conditions has been proven as powerful tool for preparation of biocompatible MOFs nanoparticles providing their administration in the living organisms.

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The Problem of Asbestos in Georgia: the Reality and the Necessary Actions

INTRODUCTION: Asbestos has been used for centuries in a number of different products, including friction products, gaskets, construction materials, textiles and paper products (Virta, 2006b). As of 2003, asbestos cement products accounted for over 85% of global asbestos consumption (Virta, 2006b). Because asbestos has been linked with the development of deadly diseases, such as asbestosis, mesothelioma and other types of cancer, many countries have reduced their production and consumption and instituted bans. WHO and the International Labour Organization (ILO) therefore recommend that the most effective way to eliminate asbestos-related diseases is to ban the use of all forms of asbestos.

AIM of presentation is to introduce asbestos-related problems in Georgia and what preventive measures should be done to eliminate asbestos-related diseases (ARD).

In Georgia, asbestos-containing construction materials have not been produced since 1992. However, demands for building material containing asbestos were high in recent years due to the development of building industry for reconstruction and dismantling of old buildings as well as for new constructions. A total of 3380 tons of imported asbestos was consumed in the year 2015- 2016. Special measures and control are not provided to the workers handling asbestos-contained materials. According to the National Cancer Centre of Georgia, there have been 164 new cases of lung and bronchus cancer in 2015, and its number increased up to 2008 in 2016. As to mesothelioma, in 2015 there have been 4 cases, and in 2016 -15 cases. Because the connection between asbestos exposure and ARDs hasn't been studied, there is no information concerning the magnitude of ARDs in the country. There is no regulation concerning the utilization and safe disposal of asbestos-contained materials and residue.

CONCLUSION: There is a great need to develop national programme for elimination of ARDs. The following steps would be considered: creation of intersectional group in connection with the exposure of diseases caused by asbestos and defining of elimination policy; identification of the sources of asbestos exposition; conduction of epidemiological studies of asbestos occupational exposure; selection of appropriate compensation mechanisms and creation of appropriate infrastructure on social protection; implementation of modern exposure assessment at the workplace; and improvement of the regulation related to asbestos.

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Phytochemical Study and Biological Activities of Selected Adjara and Adjara-Lazica Endemic Plants

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According to the World Wide Fund for Nature, the Caucasus is included into the list of 200 ecoregions which are distinguished by abundance of species, endemic index, taxonomic uniqueness, origin peculiarities and rare habitat indices. The territory of Adjara floristic region represents a part of botanical-geographical province of Colchis and is distinguished by specific diversity and identity. Endemic flora of Adjara is represented by 174 species that is 9.47% of the entire floristic composition and comprises endemics of the Caucasus, Georgia, Colchis, Adjara-Lazeti and Adjara.

Species of Adjara and Adjara-Lazeti endemic flora deserve special attention. They are spread in Adjara floristic region and have narrow-local area of distribution. There is rather scarce information about them in scientific literature. Identification of rare and endangered species of Adjara floristic region, their chemical, pharmaco-botanical assessment is one of the urgent problems in modern biology and medicine.

For the purpose of the study of the content of biological active substances, 21 herbaceous as well as woody endemic plant species have been selected, spread in Georgia, namely Adjara and Adjara-Lazica. It should be noted that the great part of the given plants is under a strong impact of anthropogenic factors.

Materials for analysis were taken in 2014-2015, early spring and late summer periods when plants are in the active growing and flowering phases. For the purpose of identification of biologically active substances, the study was conducted using GC-MS and LC-MS/MS-DAD methods.

Qualitative phytochemical analysis of the extracts showed the presence of alkaloids, terpenoids, flavonoids, steroids, saponins, tannins, and anthraquinones. These classes of phytochemicals are known to possess a variety of biological activities including antimicrobial, antioxidant, anti-inflammatory, antiplasmodial, and anticancer activities.

Based on a bioactivity-guided isolation principle the extracts of different species were assayed to explore their *in vitro* antioxidant and other biological activities. These results

indicate that a number of extracts present significant radical scavenging, antiplasmodial and cytotoxic activities towards keratinocytes and cancer cell lines.

Based on the study of their specific biological activity perspective species were revealed for the further study as well as for application in medical practice.

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Tissue Engineering and Organ Fabrication in Georgia

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Introduction and aim. The priority direction for the organ and tissue engineering is the development of a natural, biocompatible three-dimensional scaffold that can provide necessary environmental conditions for the attachment, differentiation and proliferation of the transplanted cells. In this study, we present and discuss the possibility of using natural three-dimensional scaffold from human placenta for the creation of bioengineered liver.

Research methodology. Sodium dodecyl sulfate (SDS) and 1% Triton X-100 was used for the decellularization of human placenta. The obtained three-dimensional scaffold was lyophilized and stored in the sterile environment at a room temperature until use. For the fabrication of the bioengineered liver, the decellularized human placenta was placed with its fetal surface was facing upwards. Prepared sheep micro fragments of the liver tissue were evenly distributed over the entire maternal surface of the placenta scaffold. Female sheep of Turkish breed weighing 15-20 kg (n=27) were acquired from certified facility in Georgia and housed in individual pens. Sheep were given 100 U of heparin in saline to decrease thrombosis risk. The right femoral artery and vein of sheep were isolated and partially clamped in groin on one side. The hepatized placenta was placed subcutaneously in the right ilioinguinal space of the recipient. The decellularized placental artery was connected to the femoral artery and placental vein was connected to the femoral vein by end-to-side anastomosis with 6-0 proline sutures using microsurgical technique. The arterial followed by venous clamp were removed to initiate graft perfusion.

Outcomes. After two weeks from surgery, the parenchyma of the transplanted liver micro fragments looked normal, without fatty change or cholestasis. Also, staining with hematoxylin and eosin of the tissue of human placenta showed the eosinophilic pink coloration which is characteristic for collagen. The Masson's trichrome staining confirmed these results when it showed the unified blue staining of the human placenta fibers. The

markers of endothelial cells, such as alpha SMA, showed the staining around vascular structures of the bioengineered liver. Hepatic cell proliferation was evaluated with immunohistochemical staining for Ki67, which also showed a large number of positive liver cells around the scaffold.

Conclusion. The bioengineered liver created from the decellularized human placenta can be used as a liver support system in patients at the acute phase of liver failure and help the native liver to recover, or to provide time for finding a suitable donor.

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Oral Full Thickness Non-healing Wound Reconstruction with Biologically Active Dressing

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Introduction and aim: Oral non-healing full thickness wounds are usually caused by numerous factors such as trauma, burns, chronic diabetic ulcer and different kinds of cancer. The most common cancer of the oral cavity is squamous cell carcinoma. The combination of chemotherapy, radiotherapy and surgical resection is an appropriate treatment strategy for cancer. Radiation therapy that is performed before surgery and after resection of the cancer can be the cause of non-healing wound formation. A variety of free tissue flaps have been used in the reconstruction of tumor-related defects in the oral cavity. Unfortunately, the use of flaps for the treatment of non-healing oral wounds does not solve the problem efficiently. Therefore, contemporary medicine is searching new materials that can be used for coverage of oral full thickness non-healing wounds. We hypothesized that the use of a biologically active dressing which is a combination of decellularized human amniotic membrane and freeze-dried bone marrow stem cell paracrine factors can be an effective alternative for the reconstruction of oral full thickness non-healing wounds.

Research methodology: The experiment was conducted on 20 Wistar laboratory rats. Animals were divided into 2 groups: first (n=10), where the animals were represented as the control; and second (n=10) group, in which the full thickness non-healing wound was covered with biologically active dressing. Novel biologically active dressing was created by using rat freeze-dried bone marrow stem cell paracrine factors and human decellularized amniotic membrane.

Outcomes: Biologically active dressing boosts angiogenesis and increases the reparative regeneration of the oral full thickness non-healing wounds.

Conclusion: Biologically active dressing consisting of human decellularized amniotic membrane with seeded freeze-dried bone marrow stem cell paracrine factors might be a suitable alternative for oral full thickness non-healing wound reconstruction.

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A Learning Environment as a Motivator of Education

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Introduction. When considering security policy in the education process, as a rule, special emphasis is placed on the safety of the physical environment. Representatives of the education community frequently note that infrastructure installed in schools, the adapted equipment, variety of teaching materials and prohibitions against entry by strangers into the school building - are a guarantee that learners feel themselves secure. However, the Safe School policy implies not only control of the physical environment, but addresses ensuring emotional safety as well.

Aim of research. Research is aimed at providing the care-oriented learning environment, and this is the type of the environment, which is considered by experts to be an integral part of the concept of a safe school. The environment, in which there exists a system of socio-emotional support for all persons involved in school life.

Research methodology: observation, experiment, focus-group. In 1942, Abram Maslow in his work Hierarchy of Human Needs, presented A Theory of Human Motivation. Maslow's Hierarchy of Needs is represented as a pyramid, and it has 5 levels as follows: 1 Physiological needs; 2. Safety needs; 3. Love and social belonging; 4. Esteem needs; 5. Self-actualization needs. The main needs are at the base of a pyramid. The first two levels are considered by Maslow to be basic needs. Safety and security include:

- personal safety;
- financial safety;
- health protection;
- protection against accidents and diseases.

Results. Based on the results of survey, ensuring personal safety within the school environment is of high importance for learners. Effective learning depends on the level of motivation of learner. According to Maslow's hierarchy, the learning need can be triggered by motivation of different levels. This depends on the child's age and individual characteristics. In the early grades, addressing the need for safety first, and then for belonging, is of high importance for learners, but for adolescents, the leading role is taken by the esteem needs. When learners feel isolated or neglected, they cannot become familiar even with what they are able to. At this level, it is very important for children to feel themselves as the true members of group. On this basis, there are formed the esteem need, orientation towards the results, concern for finding the own place and status in the group.

What does emotional safety mean? When the child goes to school and is not afraid that peers make fun of him, take away his items and humiliate him, and if he is not afraid to make mistakes during class and the teacher will punish him and will threat him to give failing grades. If he does not feel these sensations, he finds himself in a more relaxed mode, feels happy and actualized, he feels confident. In this case, we can say that this child is in the emotionally safe environment, and the school ensures this safety.

Conclusion. A teacher, who is able to make learners feel well and free, and who shows favorable attitude and respects for learners, is able to make them willing to learn. In order to get learners to conduct training process independently, it is necessary that they believe that they are treated fairly by the teacher, and he will not fun of them and will not punish them for unintentional mistake. In this case, learning is an interesting process, and it becomes relevant.

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Identification and the Study of Antibiotic Resistance Genes Profile of Nosocomial Infectious Agents in Adjara Region

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According to the World Health Organization, infectious diseases remain the most common disease group. Among them are the nosocomic (hospitalized) infections. The most frequent

and most important causative agents of these infections are Gram-positive and Gram-negatives bacteria. The spectrum of the causative agents of the nosocomial infection in hospitals in the region of Adjara and the antibiotic resistance were determined as the result of research.

The material was taken from immunocompromised people in resuscitations of hospital and the patients undergoing treatment for a long time at a hospital. The biological fluids - urine, blood, cerebrospinal fluid and sputum were used as the research materials. Samples taken from patients were analyzed. The following bacteria causing the nosocomial infection were highly represented *Pseudomonas aeruginosa*, *Acinetobacter spp.* And *Klebsiella pneumoniae*.

Antibiotics of different generations, used in this study, showed a high level of resistance, which should be considered. Antibiotic sensitivity was studied using the disc diffusion method where the variety of antibiotics have been used. The indicators of sensitivity for each microbe were calculated according to the regulation of Clinical and Laboratory Standards Institute (CLSI) and European Committee on Antimicrobial Susceptibility Testing (EUCAST).

It was necessary to investigate genetic mutation for determining the reasons for such a high rate of antibiotic resistance and for this purpose the molecular-genetic research was carried out. We used molecular methods for this: Polymerase Chain Reaction (PCR); Pulsed-Field Gel Electrophoresis (PFGE); Multilocus sequence typing (MLST)

The corresponding genes were chosen for the resistant strains in particular, sulfonamides- sul1, sul2, sul 3', for tetracycline-tet-A, tetD, tetG, tetC, tetE; for carbapenemes - TEM, SHV, OXA, OXA48, KPC, NDM for aminoglycosides AAC3-II, aph3, -III, AAC3-IV, aph (3') - for quinolones- qnrD, qnrS, qnrB, qnrC, qnrA, and for ciprofloxacin-CTXmG1, CTXm15, CTXmG8. Almost, all sample show the positive amplification (PCR) on determining of resistance genes. The study revealed a high rate of antibiotics resistance and determined responsible genes.

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Immunomodulatory Properties of DNMT Inhibitor 5AzaC in Chronic Inflammatory Diseases

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Introduction: DNA methyltransferase (DNMT) inhibitor 5-Azacytidine (5-AzaC) is an analog of cytosine that is metabolically activated *in vivo* and incorporated into DNA during replication. Although the beneficial role of 5-AzaC in myelodysplastic syndrome treatment is established, the potential effects of 5-AzaC on the immune system during chronic inflammation are unclear.

In order to understand the effects of 5-AzaC on immune responses during chronic inflammation we analyzed peripheral blood CD4⁺ T cells from patients with cystic fibrosis (CF). We examined the pro- and anti-inflammatory cytokine expression by T cells prior to and following 5-AzaC treatment. In addition we examined DNMTs levels in nuclear extracts of CF and non-CF CD4⁺ T cells.

Material and Methods: Seven CF patients (age: 5–12 years) were included in the study and compared to six age-matched healthy subjects (age: 6–13 years). The Ethical Committee of the TSMU (Tbilisi, Georgia) had approved the protocol and the parents of each CF patient/healthy subject provided informed consent.

Cell culture: Mononuclear cells were separated from peripheral blood by density gradient centrifugation using Ficoll-Paque-1077 (Sigma Aldrich, Germany). CD4⁺ T cells were isolated from PBMC using CD4 MicroBead kit (Miltenyi Biotec GmbH). Cells were activated with CD3/CD28 and treated with 5AzaC (6 nM).

Levels of DNMTs: After 96 h incubation nuclear extracts were prepared using nuclear extract kit (Abcam) and DNMT1 and 3a level measured in CF and non-CF T-cells using DNMTs activity colorimetric kits (Abcam) according the manufacturer's protocol.

Cytokine quantification by ELISA: Concentrations of IL-10 and γ -INF in CD4⁺ T Cell were measured by ELISA (eBoiscience, San Diego, CA, USA), conducted in accordance with the manufacturer's instructions.

Results and Discussion: We showed that 5 Azacytidine alters nuclear levels of DNMT 3a as well as modulates cytokine levels in CD4⁺ T cells derived from CF patients. After 5-azaC treatment secretion of IFN- γ was significantly decreased in CF T cells, while amount of IL-10 was elevated by ~2.5 times compared to untreated controls (P<0.05).

In summary, data presented in this report demonstrates that epigenetic mechanisms such as DNA methylation may be considered as a one of the potential therapeutic target in a treatment of chronic inflammatory diseases such as CF.

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Problems of Pollution of Atmospheric Air in Georgia

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Hygiene of atmospheric air is one of the most important among problems of Environmental Medicine. The majority of early death cases, about 100000 in European countries, are caused by pollution of atmospheric air. Protection of atmosphere from pollution is the main component in a complex of measures for environmental safety. The organization of State control system on atmospheric air and ensuring its reliable functioning is very important in a complex of measures of atmospheric air protection.

According to the National Agency of the environment of the Ministry of environmental protection and natural resources of Georgia, atmospheric air of Georgia is characterized by a variety of pollution and high concentration of the main pollutants (PM₁₀, SO₂, NO₂, CO). In almost every region, where concentration measurements of pollutants were taken, the concentration exceeded admissible values.

The main sources of pollution of atmospheric air are vehicles, industrial and thermal energy fields. Specific weight of exhausts of motor transport in the general pollution of atmospheric air is about 70-85% with growing tendency, and is caused by a number of factors: intensity and volume of released harmful substances, bad quality of fuel, technical condition of vehicle, traffic density, natural aeration (relief of the settlement, character of buildings, weather conditions, period of year), etc. The amount of pollution of atmospheric air with lead and nitrogen oxides is related to the intensity of traffic.

Atmospheric air pollution in the industrial sector of Georgia is considerably high (11-19%). The main objects, contaminating the atmosphere are: "Georgian Manganezi" Ltd. (31,0%); "Haidelberg Cement Georgia" Ltd. (19,6%); "SAQNAXSHIRI GIG" Ltd. (16,3%). Industrial facilities exhaust dust, volatile organic substances, nitrogen oxides and sulfurs, the nature of qualitative and quantitative changes of which depends on a type and productivity of the industry, level of technical and technological equipment, etc.

In a total amount of pollution of atmospheric air, the role of objects with heat power engineering is 3,5-4,0%. Facilities of the given sector, with comparably low level of air pollution, are explained by usage of natural gas, as a fuel, and specific types of pipes. The main pollutants are hydrocarbons - burning product of (PM₁₀, NO₂, CO). Quantitative and qualitative characteristics of pollutants depends on a type of the applied energy resources (coal, oil, Fuel oil, the natural and liquefied gas, etc.). The main reason for air pollution by

objects of industrial and heat power sectors is the low efficiency or absence of dust and gas-cleaning systems.

The increased concentration of pollutants of atmospheric air has impact on climate, health of the population, sanitary conditions, and personal activity. The number of smoggy days partly increases by 11,8% (Tbilisi Mtskheta). According to WHO data, 17% of incidences and 19% of mortality in Georgia are due to environmental pollution. Among the population of Tbilisi, in 19% of respondents, worsening of health condition is linked with pollution of atmospheric air.

Despite positive tendencies, because of the events held in recent years, the system of atmospheric air monitoring in the country needs radical modernization. As well as identification and assessment of the main sources of pollution and also studying of territorial distribution of pollution, that can be achieved by arrangement of modern analytic equipment in the main control points/places. It will give the chance to receive reliable data about pollution of atmospheric air that is a prerequisite for the development of aimed health improvement measures and activities for optimization of monitoring system of atmospheric air.

Lee J.

"Interventional Pain Management to Improve Quality of Life"

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Millions suffer from acute or chronic pain every year and the effects of pain exact a tremendous health care costs, rehabilitation and lost worker productivity, as well as the emotional and financial burden it places on patients and their families. The costs of unrelieved pain can result in longer hospital stays, increased rates of rehospitalization, increased outpatient visits, and decreased ability to function fully leading to lost income and insurance coverage. As such, patient's unrelieved chronic pain problems often result in an inability to work and maintain health insurance. According to a recent Institute of Medicine Report: *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*, pain is a significant public health problem that costs society at least \$560-\$635 billion annually, an amount equal to about \$2,000.00 for everyone living

in the U.S. This includes the total incremental cost of health care due to pain from ranging between \$261 to \$300 billion and \$297-\$336 billion due to lost productivity (based on days of work missed, hours of work lost, and lower wages).

When asked about four common types of pain, respondents of a National Institute of Health Statistics survey indicated that low back pain (LBP) was the most common (27%), followed by severe headache or migraine pain (15%), neck pain (15%) and facial ache or pain (4%). Back pain is the leading cause of disability in Americans under 45 years old. More than 26 million Americans between the ages of 20-64 experience frequent back pain.

Adults with LBP are often in worse physical and mental health than those without it: 28% of adults with LBP report limited activity due to a chronic condition, as compared to 10% of adults who do not have low back pain. In cases of LBP, discomfort can impede the rehabilitation process by interfering with exercise and increasing the risk of psychological distress.

Pain, especially intractable or chronic pain, used to be something many patients simply had to learn to "live" with. In recent years, however, researchers have learned a great deal about pain and its physiological and psychological basis, leading to pain management treatments that can provide complete or partial pain relief.

According to the American Society of Interventional Pain Physicians (ASIPP), interventional pain management (IPM) is devoted to the diagnosis and treatment of pain related disorders. IPM utilizes a multidisciplinary approach in which team of health care professionals work together to provide a full range of treatments and services for patients suffering from chronic and/or acute pain. The goals of IPM are to relieve, reduce, or manage pain and improve a patient's overall quality of life through minimally invasive techniques specially designed to diagnose and treat painful conditions. The discipline also strives to help patients return to their everyday activities quickly and without heavy reliance on medications. What makes interventional pain management different is that it uses techniques to directly address the source of pain. The team members of IPM include a physiatrist (physical medicine and rehabilitation specialist), anesthesiologist, general surgeon, internist, and psychiatrist. Interventional physiatry is a branch of physical medicine and rehabilitation that treats pain precisely placing anti-inflammatory agents into the spine and pelvis, guided by specially equipped X-ray machines. Interventional pain physicians may perform selective nerve root blocks, facet joint procedures, spinal cord stimulation, epidural injections, intrathecal pump placement, trigger point procedures, vertebroplasty, discography, intradiscal electrothermal therapy (IDET), etc.

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Rusting stress-connected curing preparation

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Under the rusting stress is understood the information when the organism has tendency towards the oxidative processes, which is caused by misbalance between the substances containing reactive oxygen and the antioxidant protection mechanism. We reckon the oxidative stress participates in many pathologic condition developments, as well as the aging process enhancement.

"Margali Plus" is a remedy that contains iron, sulphur, camomillae tincture, Helichrysum and plantain and nettle leaves. The preparation is used as hepato-protecting, desintoxicating, liver function improving, regenerative processes favoring and cholagogic substance. Its therapeutic indications are chronic hepatitis, bile-stone diseases, and cholecistites.

Before today, they did not know the mentioned preparation high antioxidant activity. As a result of the research held by us we have found that the "Margali Plus" capsules when appeared in intestines (where is the acid area, in particular the mixed salty acid) the sulphur hydrogen. Physiologic role of the sulphur hydrogen in the human organism as an air-transmitter was found in the beginning of current century. This signal molecule plays significant role in the nervous system, heart and blood vessels system, immune system, intestines system regulation and in different organs substances interchange.

Thus, high antioxidant activity is explained by the sulphur hydrogen occurring when taking in the preparation "Margali Plus" and the highly expressed effectiveness for aging decreasing and for the treatment and prophylactic for the following pathologic condition: age-connected neurodegenerative conditions, heart and blood vessels system, eclampsy and pre-eclampsy, erectile dysfunction (patent GE P 2015 6404 B).

Makaradze N.

Health and Safety Standards for Preschool Children and Preschool Teachers' Competences

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Social-emotional and cognitive development of children is possible only after ensuring their health and safety. Correspondingly, preschool teachers constantly need to care for children's health and safety. However, officially they did not have this responsibility until now, since there was not any professional standard for preschool teachers.

Despite all the care and attention, there are many cases of health problems in the kindergarten as well as at school. Sometimes, it is just a minor traumatic injury, but sometimes the danger threatens the child's life. Naturally, every second is important and before the intervention of a qualified person, the caregivers or preschool teachers face necessity to give the first aid as soon as the child is injured or becomes ill. That is where two main directions of the problem is raised - the competence of preschool teachers in giving first aid and the adequate environment in the kindergarten or school.

A large number of interviewed preschool teachers consider that they do not have the right to give the child the first medical care when appropriate. Besides, they think they are not allowed to provide a basic medical treatment or give a medicine to the child (which is brought by the parents) in case the child feels sick. However, they cannot name the source -which document restricts this right.

In one of the chapters of new Professional Standard for Preschool Teachers, the separate sub-section is dedicated to health, safety and nutrition. The standard considers the teacher's skills such as: "The preschool teacher protects the health and safety, hygiene and nutrition standards and regulations"; "Constantly observes the health of each child and, if necessary, provides appropriate help (including the first medical aid)", etc. Naturally, in future, preschool teachers prepared on the basis of mentioned standards will be equipped with these competencies. However, in this transition period, when the most of the in-service preschool teachers do not have special education in this field, we cannot talk about owning these competencies.

In order to solve the problem, we think that timely first aid trainings for preschool teachers are necessary through providing certified training-courses. This responsibility should be equally taken by kindergarten unions as well as local self-governments, as the lives and future of our future generations depend on the knowledge and competences of caregivers and preschool teachers.

Makaradze N.

The Problem of Personal Space in Educational Institutions

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The problem of personal space is one of the most important problems in the education system and it is equally relevant for the preschool, general and higher education level. The space around students and preschoolers environment and comfort have significant impact on the establishment of a positive attitude towards learning and improvement of academic achievements. Creating an appropriate environment is not only important and necessary factor in the learning process, but also one of the primary demands of the consumer.

Unfortunately, nowadays, there is no survey that directly concerns the study of the problem of personal space in educational institutions. Studies in this direction mainly concern the environment in educational institutions and almost all of them confirm that the quality of the physical environment is closely related to academic achievements.

Proper equipment improves the quality of the environment, environmental quality affects the development of collaborative relationships, relationships affect the behavior of learning and learning, behavior affects academic achievement, and academic achievement determines the future of the person and, in general, the future of society. Environmental quality on the one hand, determines the basic conditions, including compatibility and sufficient space, air temperature, natural lighting, stability and general sanitary norms, although this is not necessarily a sufficient condition in order to successfully complete the learning process and end up with relevant results. The environmental component is only part of the problem that is called a problem of personal space and that is important for the educational establishment, such as the number of pupils or students in the group, class or auditorium, Enough space for the implementation of various activities in the above mentioned environment, The existence / space of corridors and waiting rooms in the educational institution, the number and location of the bathrooms, the existence of the foodstuff, its area and the means of free use of this facility, yard space and its suitability for use and so on. We do not say anything about parental access to the establishment, waiting rooms for the parents and etc.

Nowadays the subject to the authorization procedure are the private institutions on the secondary educational level and both private public institutions on the level of higher education. As for the preschool educational institutions they are in the process of the preparation for future authorization. Still their majority does not meet the private space requirements.

It is also important that this problem is not only related to children, pupils and students, the problem is spread to educators, teachers and lecturers. Studies conducted by us testify to the existence of problems in this direction which we held with three representatives of educational institutions, (The survey did not cover only the vocational education level, which turned out to be one of the most disciplined steps in this direction). As a result of

the survey, it was also revealed that the most unregulated environment in the field of personal space is in pre-school educational institutions, however, problems are both in general and higher education levels. The private sector is particularly noteworthy, despite the expectation and demand, in the main case there is radically different reality and starting with the issue of personal field, all of the above mentioned problems exist.

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Cardiovascular Screening of Adolescent Athletes: Challenges and Outcomes

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Introduction and aim: There is substantial evidence, all from observational epidemiological studies, to support an inverse relationship between physical activity and cardiovascular disease risk. From the other hand, varieties of cardiovascular abnormalities have been found to be responsible for sudden cardiac death (SCD) in competitive athletes. By a number of studies it has been convincingly demonstrated that the lesions responsible for athletic field deaths differ with regard to age, and at the same time vast majority of SCD occur in athletes aged <18 years old. Appropriate pre-participation screening of young competitive athletes can detect "silent" cardiovascular abnormalities and reduce their risk for SCD. Aim of the study was to analyze cardiovascular findings obtained in the pre-participation screening of elite Georgian adolescent athletes.

Research methodology: Observational follow-up study was performed in the Sports Medicine and Rehabilitation Clinical Centre of Tbilisi State Medical University. Study group of 227 asymptomatic elite adolescent athletes (83% males), age $15,4 \pm 1,6$ years, representatives of national teams of 9 sporting disciplines (cycling, basketball, handball, volleyball, football, tennis, judo, swimming, water-polo) underwent cardiovascular (CV) evaluation with medical history, physical examination, 12-lead resting and exercise ECG, and transthoracic echocardiography (TTE) in 2013-2015. The participants were followed prospectively until July 2015 with respect to clinically significant cardiovascular abnormalities, and until February 2017 with respect to safe return to sport. Mean \pm SD values for the 227 athletes were: age $15,4 \pm 1,6$ years, body mass index $23,9 \pm 1,4$ kg/m², body surface area $1,72 \pm 0,18$ m².

No athletes had previous medical history of cardiovascular disease (CVD) or a family history of SCD.

Results: Resting ECG revealed common/training-related ECG alterations in 70(31%) athletes, as well as uncommon/training-unrelated changes: T-wave inversion in 1(0,4 %), left axis deviation in 2(0,9%), frequent premature ventricular contractions in 2(0,9%). Maximal oxygen uptake of athletes was 53.7 ± 3.6 ml/kg/min.

Echocardiographic data were following: interventricular septum and posterior wall in diastole $9,1 \pm 1,4$ mm and $8,9 \pm 1,5$ mm respectively, LV end diastolic diameter $51,6 \pm 3,8$ mm, LV mass index $112 \pm 21,8$ g/m²; LV ejection fraction($65,7 \pm 2,4$) and diastolic function(E/A: $1,9 \pm 0,4$, E/E': $6 \pm 0,41$).

TTE revealed mitral valve prolapse in 8 (3,5%) athletes, bicuspid aortic valve in 1(0,4%), and signs consistent with anomalous origin of left coronary artery from the pulmonary artery (ALCAPA) in 1(0,4%) athlete. Stress test revealed decreased exercise tolerance and negative T-waves in V4-V6 in this athlete. Athlete was directed to further CV investigation and CT angiography led to the diagnosis of ALCAPA.

Coronary artery bypass grafting was performed. After treatment athlete underwent cardiac rehabilitation program and risk-stratification before entering sports activity. As subendocardial ischemic pattern still existed, the athlete was advised against current participation in competitive sports. Follow-up over a longer period has been planned.

Conclusions: PPS is significant tool to identify adolescent athletes at risk for exercise-induced SCD. As coronary anomalies are among the common reasons for SCD in young individuals, timely identification and appropriate clinical management, including considerations regarding safe return to sport are necessary.

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The Study Results of Local and Introduced Plant Species of High Antimicrobial Actions Growing in Adjara Black Sea Littoral

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In the modern age, one of the topical problems of the medical and biological sciences worldwide is the search for medicinal plants in order to expand raw material base and increase the assortment of medicinal and prophylactic means of vegetative origin. In phytotherapy, in the scientific as well as folk medicine, homeopathy and agriculture plenty of species are used. However, the application of plant biodiversity in this purpose has not

thoroughly been studied and utilized so far. The reason is the absence of data on the resources, incomplete data on biologically active substances or else, there might be objects with high activity but their pharmacological, antimicrobial and other properties have not been investigated yet.

We have been investigating antimicrobial actions of local and introduced plant species in Adjara Black Sea Littoral for years. The research includes various plant pathogenic microorganisms based on the research of the Institute of Phytopathology and Biodiversity. The results obtained during last two years are represented.

Cultivated strains of pathogenic fungi and bacteria (*Ralstonia solanacearum*; *Curvularia*, *Pestalotia*, *Alternaria*, *Botrytis cinerea*; *Trichotecium roseum*; *Pirenophora tritici-repentis*; *Fusarium solani*, etc.) were studied, a zoological microorganism *Paramecium caudatum*.

Disc Diffusion Method was used for the evaluation of antibacterial activity *in vitro*, while antifungal efficacy was determined according to death speed of protists.

There were selected the plant species for the research, on which the strains of the quarantine bacteria *Ralstonia solanacearum* has revealed high sensitivity in recent years. We included the following plant species in experiments 2015-2016: *Parrotia persica* (DC.) C. A. Mey, *Hamamelis japonica* Sieb. et Zucc., *Hamamelis mollis* Oliv., *Liquidambar styraciflua* L., *Parrotiopsis jaquemontiana* (Decne.) Rehd., *Corylopsis sinensis* Hemsl., *Liquidambar formosana* Hance., *Eucalyptus cinerea* F. Muell. et Benth., *Laurocerasus officinalis* M. Roem.

For testing the extracts from selected plants for antimicrobial activity, there were produced 1% solutions of extracts taken from the leaves prepared with methyl, diethyl ether, hot water and cold water.

Solutions made of the extracts of the following species: *Liquidambar styraciflua*, *Parrotiopsis jaquemontiana*, *Corylopsis sinensis*, *Liquidambar formosana*, *Eucalyptus cinerea*, *Laurocerasus officinalis*, *Hamamelis mollis* prepared with methyl and diethyl ether have revealed high antimicrobial activity and caused suppression of strains development in bacterial and fungal pathogens.

Recommendations for their practical usage will be put after studying the biologically active substances of the mentioned species and carrying out a repetitive experiment for antimicrobial activities.

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Secure Use of Computer Technologies in the Learning Process

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It is well known that the role of computer technology in the modern society has greatly increased. The computer has moved from the office to schools and homes.

The trends of the global educational system clearly show that the success of the learning process depends on the present day - and will be more dependent on the future - how successful the role of information technology in the educational process will be.

The National Center for Teacher Professional Development has been implementing trainings for IT communication and communication technologies in Georgia since 2009, which aims to improve teachers' qualifications and improve the learning environment through integrating information communication technologies. According to the National Curriculum for 21st Century Skills (Media, Information, Technological), the subject of information and communication technologies, which envisages the establishment of competencies related to the use of IT in the students is included in the curriculum for first grade of secondary school.

Since 2008 school first graders come with a very expensive and valuable gift for them. Thus, children have more and more time consuming with computer technologies, which in turn creates the risk of adaptive behavior in children and adolescents (computer games, social network dependence). We will try to find out what risks are seen by older people (parents and teachers) when using computer technologies in the learning process and how they can be avoided.

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Blood Typing in Donors with Classical and Modern Methodology and its Application

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Erythrocytes, leucocytes, thrombocytes and plasma proteins are the carriers of blood group antigens. For clinical medicine erythrocyte group antigens are very important as they precondition blood compatibility and are the main reasons of post-transfusion

complications. These antigens represent a genetically firmly-determined peculiarity. Erythrocyte group systems are sharply distinct features of immunogenetic polymorphism. In cases, when antigens are not synthesized due to certain reasons or are weakly expressed, it becomes difficult to identify them with immunoserological method and therefore increase during phenotyping. In order to avoid errors during the determination of blood groups, we need to know the source of these errors. Our research aim was to choose the best methods for blood typing. Research subject was the 743 donors and 80 newborn.

Methods: Express method approved in immunoserology was used in the study. The following specific test-systems were used during the research: anti- A, B, D, Cw, -C, -c, -E, -e, -K, -k, -M, -N. Erythrocyte blood group antigens were examined using immunoserological methods. Erythrocyte blood groups were conducted using a variety of minor-monoclonic antibodies. The method is based on the principle of agglutination of homonymous antigen-antibodies. RH, blood groups in newborns and donors were also determined with the method of column agglutination. AHG (anti-human globulin) plates, so-called ID cards were used for research.

Results: 51,55±1,83% of studied 743 donors have blood O(I) group, 36,34±1,76% - A(II) group, 9,15±1,06% - B(III) group. 2,96±0,62% is bearer of blood AB(IV) group. Rh(-) phenotype bearers donors are presented by 16,55±1,36%, Rh(+) phenotype ones - by 83,45±1,36%. Rh rhesus system phenotype groups are often presented by CcD-ee phenotype with 30,01±1,68%. Then comes CCD-ee - 16,82±1,37%, ccddee - 15,21±1,32% and CcD-Ee - 14±1,27%. Relatively less we can find ccD-Ee phenotype with 10,63±1,13%, ccD-ee - 5,25±0,84%, CcD-EE and ccD-EE phenotypes distribution is presented by 2,56±0,58. CCD-Ee phenotype frequency 1,35±0,42%, CCD-EE phenotype 0,54±0,26% and Ccddee phenotype 0,8±0,33%, ccddEe and CCddee phenotypes 0,13±0,14% are fixed. Kell system phenotype research resulted in K-phenotype frequency 91,92 ±0,99% and K+ phenotype 8,08±0,99%. 23.3% From the Studied O (I) group's infants are carriers both anti-A, and anti-B antibodies, but none of the antibodies was observed in 33.3% of cases. 23.3% of infants are exclusively carriers of only anti-A antibodies, while 20% of anti-B antibodies. 33.3% from the examined A (II) infants has the same antibodies structure as adults and in the case of 55.6% natural antibodies has not been revealed. Two infants from B (III) the group are carriers of anti-A antibodies. A study also revealed a different A antigen agglutination reaction in newborns and adults. All pregnant women had ccddee phenotype group. Anti-Rh antibodies were found only in 13.2%. Output of antibodies in the first trimester of pregnancy has not occurred in any case. The synthesis of the anti-Rh antibodies begins after the two month of embryonic development and reaches a maximum at the time of delivery.

Conclusion: Such methods as plates and cassettes are preferable for ABO typing in donors and newborns, especially with complications. It is much more better to use Gel Agglutination Cassette and plates than Glass Beads Cassette for ABO typing in newborns with complications. If we use the above mentioned methods in the plates or glass it will be better to use NaCl and several times washed red blood cells.

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Global Climate Change – New Challenges to Education

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Global climate change presents new challenges not only to science but also to education system in general. As a global threat to the environment and to population health, these challenges are unique and urgent. Although research on global climate change is rapidly advancing around the globe, we lack professionals dealing with the problems based on modern theoretical knowledge, evidence-based practice and environmental health ethics. It is obvious, that the topic of global climate change is the most sensitive to higher education aiming at the preparation of new human resources.

Several questions come out. How much do we know about the global climate change itself and its impact on the environment and human health? What works – what evidence-based practice can be applied? What teaching and learning resources we possess and how we can extend and expand our knowledge - on the basis of our own or we need just to adapt international evidence-based experience to local peculiarities. These questions should be addressed properly in timely manner.

The need to teach evidence-based practices to health professionals requires research to play a prominent role in the climate change curricula. Capacity building in modern research on emerging challenges is of critical importance and presents one-step forward in developing new teaching environment with new disciplines and/or programs/modules to be developed in response to Global Climate Change impact on the environment and human health. A brief list of such modules may cover Global Climate Change and Public Health Systems, Epidemiology of Global Climate Change, Modern Ecology, Public Health Policy and Strategy during Global Climate Change, and alike.

International Conventions, Declarations and International Agreements on global climate change and adaptation should be highlighted and incorporated in the relevant programs.

International collaboration is another perspective that opens opportunities for joint research and elaboration of new mechanisms of adaptation to changing environment and consequently, effective controlling of environmentally related diseases, mitigating their impact on human health and reducing a significant burden, they contribute to human morbidity and mortality globally.

Addressing climate change challenges requires a dialogue between science, education and practice in diverse environments. The use of standardized curricula and methodology along with others will largely contribute to the achievement of our ultimate goal – Creation of human resources efficiently dealing with new challenges – communicable and non-communicable diseases from environmental risks.

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Genetic Polymorphism and Drug Metabolism

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Introduction and aim of study: Patients vary widely in their response to drugs. The reasons are diverse and complex. Experts estimate that genetic factors account for 20 to 95 percent of patient variability in response to individual drugs. Warfarin (Coumadin) is the most commonly used vitamin K antagonist for prevention and treatment of thrombotic disorders. Anticoagulant therapy with warfarin is characterized by a wide inter-individual variation in dose requirements and a narrow therapeutic index.

Genetic polymorphisms may influence the action of a drug by changing its pharmacokinetics or its pharmacodynamics. Polymorphisms for many drug-metabolizing enzymes and drug targets (e.g. receptors) have been identified. Although currently limited to a few pathways, pharmacogenetic testing may enable physicians to understand why patients react differently to various drugs and to make better decisions about therapy.

Warfarin is metabolized primarily via oxidation in the liver by CYP2C9, and exerts its anticoagulant effect by inhibiting the protein vitamin K epoxide reductase complex, subunit

1 (VKORC1). Three single nucleotide polymorphisms (SNPs), two in the *CYP2C9* gene and one in the *VKORC1* gene, have been found. They play key roles in determining the effect of warfarin therapy on coagulation. A patient's testing for *CYP2C9* and *VKORC1* genotypes can be used to help determine the optimal starting dose of warfarin. Patients who carry at least one copy of such a variant allele (such as *CYP2C9**2 and *CYP2C9**3) have reduced metabolism leading to higher warfarin concentrations. On average, they require a lower daily warfarin dose than patients who are homozygous for the *CYP2C9**1 wild-type allele. The *VKORC1* gene encodes the vitamin K epoxide reductase enzyme, the target of warfarin. Patients who carry the -1639G>A polymorphism in the promoter region of the *VKORC1* gene are more sensitive to warfarin and require lower doses. Prevalence of above mentioned genetic polymorphism vary widely in different populations.

The aim of the study was to estimate the frequency of genetic and allelic variants of *CYP2C9* and *VKORC1* genes in Georgian population patients with venous thromboembolism and their effects on warfarin dose requirement.

Methods: A total of 50 Georgian patients with venous thromboembolism were genotyped by PCR analysis for the three single nucleotide polymorphisms (SNPs) of *CYP2C9* and *VKORC1* genes and were followed prospectively in determining the optimal starting dose of warfarin.

Results: In 40 (80%) patients were found *1/*1 wild-type variant of *CYP2C9* gene in combination with GG or GA genotype of *VKORC1* gene and follow to recommendations of Clinical Pharmacogenetics Implementation Consortiums (CPIC), starting daily dose of warfarin was more than 7 mg in this study group, considering also physical constitution and age of patients. Only in one patient was found rare malfunctioned genotype *CYP2C9**2/*3 and *VKORC1*A/A and daily dose of warfarin was 1mg. This patient had bleeding under taking of 2 mg of warfarin and only after this episode has performed pharmacogenetic testing. Alternative, less active alleles *CYP2C9**2 and *3 were detected in 9 (18%) patients.

Conclusion: Most of investigated patients required the highest mean daily dose of warfarin and these results resemble the data of Caucasian populations. Distribution of studied polymorphisms in Georgian population and clinically effective dose of warfarin, considering patients' genetic profile, coincides with the recommendations of CPIC. Noteworthy the fact, that generally, doctors in Georgia prescribe genetic tests to patients when the average dose of warfarin is not effective. Although still in its infancy, the field of pharmacogenetics and pharmacogenomics already provides useful clinical information to enhance patient care and offers a growing potential to individualize drug therapy and improve clinical outcomes. Understanding importance of these results will help clinicians and healthcare professionals in successful management of thrombotic disorders by considering molecular-genetic

studies, which is the corn stone of development of the personalized medicine depending on genetic individuality.

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Inclusive Education in Preschool Institutions

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Introduction and Research Goal. One of the most important problems of early and pre-school education and modern educational institution is to increase the effectiveness of the childcare process and overcome the failure of child development. It is necessary that in each particular case, to be correct and timely, to find out the reasons for failures, to determine the needs and to prepare an individual plan, i.e., the change in the training program (modification) taking into consideration the needs of the child. It is possible in the context of inclusive education, children with special educational needs to achieve progress in education and social integration.

Georgian Law - Early and pre-school upbringing and education - according to the inclusive education is an educational approach, under which the education system provides the facility for all children in the provision of quality education to their individual needs, regardless of the children's physical, cognitive, sensory, social or other characteristics.

Purpose of study: To detect hindering in pre-school age child development and develop its overcoming methods. For this, we studied the skills of early and pre-school children and identified the needs. Let's reveal the pedagogic methods and methods that help us to correct the child's delays in a timely manner. Therefore, as research object have been chosen Batumi public kindergartens children.

Research Methodology. We used the convergent phase for research, because it was difficult to come to the result using only one of the methods. Thus, we carried out nursery educational program analysis in order to find out how much it was possible to adapt it for the needs of the child; for the assessment of pre-school age children we used the form of assessment of the preschool age preschool children jointly compiled by the Ministry of

Education and Science and National Curriculum and Assessment Center currently active the preschool age Child Assessment Form.

Results. We have experimentally and theoretically proved that early and pre-school education and development institutions there is not paid proper attention to the development of children timely detection of hindering and drawing up an individual plan for them, the pedagogical approaches are found which promotes creation of a special educational need to develop the child's adequate development and reducing the problems at later stages of learning.

Conclusion. Research results will be used to identify the disruption of children in preschool age, to identify the needs and to fix corrective ways that will contribute to the development of the child.

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Photodynamic Therapy Using Natural Products: A Safe and Efficient Technique for Tumour Targeting

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Introduction. Since its inception, photodynamic therapy has served as a valuable tool in cancer therapeutics. Photosensitisers used for photodynamic therapy (PDT) are often susceptible to rapid degradation or suffer from poor bioavailability. Liposomal encapsulation photosensitisers is an advantageous approach wherein the active substance is protected from degradation in the physiological environment and is made available for cellular uptake in a more biocompatible form. Photosensitisers curcumin, hypericin and indocynine green (ICG) have been used to study the phototoxic effects using LED and laser based PDT. *In vitro* cell health, cellular uptake and reactive oxygen species (ROS) assays were performed to determine the outcome of the therapy. To get a better insight of the synergistic effects *in vivo*, chick chorioallantoic membrane model (CAM) has been used.

Research methodology. Physicochemical analysis of the liposomes was performed by dynamic light scattering and laser diffraction velocimetry. Structural and morphological analysis was carried out by transmission electron microscopy and atomic force microscopy respectively. The photocytotoxicity of the photosensitisers was assessed *in vitro* in SK-OV-3 human ovarian carcinoma cells. PDT was performed using a prototype LED irradiation

device (Lumundus GmbH, Eisenach, Germany) and Weber Needle® Endolaser (Weber Medical GmbH, Lauenförde, Germany) capable of irradiating intravenously to ensure homogenous distribution of light. The efficiency of the PDT as a function of cell viability was evaluated by MTT assay. Photo-destructive effects of PDT on the microvasculature were studied *in vivo* using CAM. ROS assay was used to determine the inhibition of ROS as a function of PDT.

Outcome. Physicochemical characterisation showed that the liposomes prepared were in a size range suitable for efficient cellular uptake (<200 nm). Structural and morphological analyses confirmed the presence of homogeneously distributed lamellar vesicles. *In vitro* studies revealed the phototoxic effects of different photosensitisers in a dose dependent manner. Drastic reduction in cell viability was observed in irradiated samples. Inhibition of ROS could be confirmed from the outcome of ROS assay. CAM micrographs showed thrombosis and occlusion of microvasculature inside and outside the irradiated areas post-irradiation. The thrombotic effect was local and had no deleterious effect on the survival of the embryo.



Fig: PDT in CAM using ICG loaded liposomes: (A) pre-irradiation (B) post-irradiation (C) 20 min post-irradiation

Conclusion. Liposomal encapsulation of naturally occurring photosensitisers enhanced the outcome of the PDT. Efficient cellular uptake has been achieved using liposomes. Liposomal formulations exhibited phototoxic effects at much lower concentrations than the free drug. Using PDT in combination with novel liposomal delivery systems containing naturally occurring photosensitisers, tumour tissues could be targeted and destroyed in a precise and controlled manner.

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New Technologies in Pharmaceutical Industry Supply Chain

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Introduction and the purpose of the research: Regulation of pharmaceutical business is related to meet and continually develop the requirements of appropriate international standards at all stages starting from elaboration of a pharmaceutical product, to development, production and its' distribution. The main load comes of course on production and quality control of a product, but recent trends show that no less focus is placed on the supply chain issues also.

In this report, we review the trends of recent changes in the field of international regulation concerning the supply chain of pharmaceutical products. We analyze the main reasons that led to arise the need to tighten the regulation, we will concern the challenges which pharmaceutical companies have to address on the international markets, we will review the practical results of the research "on product supply chain temperature/humidity mapping" which has been carried out at the pharmaceutical company GMP.

Research methodology: Research methodology has been developed by Georgian, American, German and Swiss experts' participation (pharmacists, IT specialists, managers involved in the distribution process). Specific issues related to the product have been taken into consideration as well as geographical features of the supply chain and factors of seasonal variations. The technical side of the research implementation included the use of modern IT technologies.

Results / conclusion: As a result of the work which has been carried out, the permanent monitoring points in the supply chain have been identified, which allows controlling the product shipping and storage conditions in the continuous mode, which ultimately aims at introducing a reliable quality management system and above all care for a patient.

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Management of Physical Rehabilitation in Patients with Osteochondrosis of Lumbar Spine

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Osteochondrosis of spine is the one of the most prevalent diseases among the all musculoskeletal conditions. Osteochondrosis is not a curable condition and its treatment/rehabilitation is a long-term process.

The present work aims to assess clinical effectiveness and duration of outcomes of rehabilitation that includes complex and consequent methods (algorithm) of a treatment. The pilot study has been continuing several years and now is going on. The subject were 220 patients, 122 females and 98 males, aged 50-65 (adherence to treatment 100%) with as reflex as well radicular syndromes in subacute phase. Informed consent was obtained from all patients. Rehabilitation process continued 2.5-3 months and its management included the following consequent methods: waist fixation, pain control with medication (NSAIDs and in some cases steroidal drugs), iontophoresis with karipazim - 20-25 sessions, after 8-10 sessions of the latter manual therapy was added - 10-12 sessions, and kinesiotherapy (3 times per week) after 5 procedures of manual therapy. After pain management recommendation of daily life activity was given. Oral chondroprotectors after completion of a treatment were administered.

Dynamic evaluation of subjective and objective symptoms, mobility and functional state of spine were done. Parameters were assessed before treatment, after 3 month and 1-3 years upon its completion. Data were analyzed using SPSS program. Obtained results showed that after the first course of treatment (3 months) positive outcomes were observed in 198 patients (90%), 22 (10%) of patients required the second course of rehabilitation. Stable outcome of treatment was maintained after 1 year in 204 patients (92,7%) and after 3 years in 196 patients (89%).

Thus, approbated complex of treatment is established to be effective in rehabilitation of patients with lumbar osteochondrosis.

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Rational Design of Novel Highly Potent Small Molecule Inhibitors of Rhinovirus Replication

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Introduction and aim. Acute respiratory tract infections are a frequent cause of infection worldwide and they represent an important financial burden on health systems.

Rhinoviruses (RVs) are responsible for more than one-half of upper respiratory tract infections. Today, the lack of efficient antiviral treatment/vaccine and their recent association with more severe disease justify efforts towards the research of antiviral drug development. The aim of this work is to develop novel RV inhibitors with selective and broad(er)-spectrum activity applying new antiviral drug discovery methods known for their elaboration faculty into quality LEAD compounds.

Research methodology. The project is organized into four interconnected facilities and was conducted using chemistry, bio-assay and docking-guided strategy; it was decided to make use of crystal structure methodology to focus the chemistry efforts and SAR analyses.

Outcomes. More than 250 molecules have been synthesized; hits with half maximal effective concentration (EC_{50}) values in the range of 0.02 – 0.04 μ M have been described. The molecular mechanism of action has been solved. Time-of-drug-addition studies revealed that hits interfere with the earliest stages of virus replication similarly to pleconaril, as capsid binder. The elucidation of the crystal structure of the HRV14/hit complex revealed the existence of multiple hydrophobic and polar interactions between the VP1 pocket and considered hit (PDB ID: 4PDW).

Conclusion and perspectives. Our promising LEAD candidates need to be optimized with the goal to ameliorate their properties according to these of the last drug candidate developed: vapendavir (including spectrum of activity). Besides, the newly described and characterized HRV-C type, which is implicated in more severe outcome of diseases, gives new challenges including the identifications of the key interactions for (an) inhibitor(s) to develop (a) broader spectrum LEAD (s) and improving the binding mode of optimized compounds. The perspectives are numerous including the description of higher affinity compounds by using versatile methodology and develop *in vitro* and *in vivo* ADME-tox studies for drug candidates.

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Advanced Technologies in Diagnosis of Sleep Disorders: Actigraphy

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Insomnia is a persistent difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity and circumstances for sleep and results in some form of daytime impairment. It affects an individual's performance, safety, quality of life and can induce other medical disorders.

Approximately 20000-40000 people in Georgia need medical help for insomnia.

Aim: First time in Georgia SEIN-SKUH Center of Epilepsy and Sleep Disorders conducted study to evaluate role of Actigraphy in diagnosis of insomnia.

Sleep diaries are integral part of insomnia diagnosis. However, the accuracy of the sleep diary is entirely dependent on the patient's perception. Therefore, to complement data we used objective assessment tool, actigraphy that is accurate and more accessible for evaluating sleep-wake cycles in a natural environment.

Method: Study of patients with preliminary diagnosis of insomnia referred to our center in 2016 was carried out. Patients were assessed using actigraphy paired with sleep diary, duration 7-14 days.

Actigraphy is miniature computerized wristwatch-like devices, which allows continuous recording human activity from few days up to several weeks. This record is used to estimate sleep parameters with specialized algorithms in computer software programs.

30 patients were included into the study: age -17-55 years, sex: female- 5, male -25. Majority of patients were on medication, treatment was not changed during our survey. Total sleep time, sleep onset latency, wake after sleep onset (WASO), awakenings, daytime naps and sleep efficacy were considered for objective analyses of sleep.

Results: Twenty-six patients (86,6%) out of thirty completed study. Compliance with Actigraphy was 94% while only 60% of diaries were completed properly.

Comparison of Actigraphy and sleep diary data showed significant difference between subjective perception and objective data: Sleep Efficiency: Actigraphy: 84.85 % (40.1-95.2) /Sleep dairy: 74,63% (40-85)

Total sleep time: Actigraphy: total avg: 6.5h (2.49-11.00) / Sleep dairy: 5.5 h (1-8)

Sleep onset latency: Actigraphy: 21.05 min (0-153) / Sleep dairy: 92 min (30-120)

Wake after sleep onset (WASO): Actigraphy: 42.51 min (6-120) / Sleep dairy: 101 min (0-180)

Awakenings: Actigraphy: 23.37 (6-39) / Sleep dairy: 13.2 (0-25)

Daytime naps: Actigraphy: 2-5 times, duration: 5-120min / Sleep dairy: 0-2times, duration: 5 -60 min.

Final analysis of Actigraphy distributed patients according to the following diagnoses: insomnia diagnose was confirmed in 10 patients, 10 cases - sleep complaints were due to

circadian rhythm disorder, 3 cases - misperception of sleep (paradoxical insomnia), 3 cases - other sleep disorders were suspected and required additional investigations (Polysomnography, Multiple sleep latency test).

Conclusion: This study provides additional evidence supporting the clinical utility of actigraphy for assessing sleep among insomnia patients.

Actigraphy is powerful tool to collect objective data on sleep pattern and can be used as a cost effective, accessible method to diagnose and screen large population with sleep disturbances.

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Violence and Safety in Georgian schools

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Safety at school is one of the priorities of the Government of Georgia. Safety is a premise for education, proper upbringing and development of a child. Provision of secure environment, strengthening of discipline and eradication of facts related to violence is the first objective of the state. In case of physical or verbal abuse, the school is responsible to immediately react to the case.

The matter of violence with regard to children is quite problematic in our country and it requires fulfilment of specific measures to help the victims of violence and to prevent the child abuse. School, family, society, state must assist children in development of their own social environment that will ensure obtainment of proper education and serve as a precondition of normal life.

In order to make school a safe place, we must know about the factors that increase risks of danger at schools. Researches show that there could be several determinants: other children of same age, family, community, environment, structure of school, teacher and so forth. Each factor may become a source of peril. All important indicators that play their role in the safety of school may be unified into two large groups: factors that arise outside of school and factors that are stipulated by the organizational or educational structure of the school.

The following article also discusses main forms of disgraceful attitude toward the children that negatively affect physical, emotional, social and intellectual aspects of development of the child. In addition, discussions further move to children who become victims of bullying.

The ways to implement preventive programs aimed to decrease scale of bullying at school are also presented.

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Nanomechanical Properties of Selected Single Pharmaceutical Crystals as a Predictor of Their Bulk Behaviour

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roduction and Aim

Material's properties are generally defined as those qualities or characteristics that determine its nature. They are typically categorised as: i) physical, ii) chemical, and iii) mechanical. Physical and chemical characteristics are nowadays standards and are used for describing-qualifying the input materials, either as APIs or excipients. Data about mechanical properties of particulate matter are less common, if at all. These properties can be, contrary to physical and chemical ones, different with the scale and are therefore either on the bulk or single level. Bulk properties represent a macroscopic view and describe the average (large amount of particles) behaviour of materials, whereas at the single particle or microscopic level matter is characterised by the local properties of its structural units. Materials' mechanical characteristics are relevant when pharmaceutical materials are submitted to the technological processes, i.e. milling and mixing, dry granulation and very much to the compaction. More precisely, elasticity, plasticity and brittleness as characteristics are commonly examined to evaluate mechanical properties using a variety of approaches at the single and bulk levels. Despite the influence that mechanical properties have on industrial-scale production and handling, their evaluation is still uncommon today. The mechanical behaviour of crystalline solids depends on the types and strengths of bonds among the molecules, their packaging, and any lattice defects that might be present. The types and distribution of defects have a significant impact on the plasticity and brittleness specific for crystals and their aggregates.

The main goal of present research was to assess the mechanical properties of some APIs' polymorphic forms at the single-crystal level (piroxicam, famotidine, nifedipine, olanzapine) in order to predict their bulk deformational attributes and behaviour, which are critical for technology processes.

Research Methodology

The mechanical properties of oriented single crystals were determined using instrumented nanoindentation (Continuous Stiffness Measurement). All APIs' polymorphic forms investigated were previously identified using a combination of calorimetric (DSC) and spectroscopic techniques (FTIR).

Outcomes

Mechanical properties such as Young's modulus (E) and indentation hardness (H) were consistent with the molecular packing of the polymorphic forms investigated with respect to crystal orientation. For mechanically interlocked structures, characteristic of most polymorphic forms, response of single crystals to indentation was isotropic. The material's bulk elastic properties can be successfully predicted by measuring Young's modulus of single crystals because a good linear correlation with a bulk parameter such as the tablets' elastic relaxation index (ERI) was determined.

Conclusions

The results confirmed the idea that the intrinsic mechanical properties of pharmaceutical crystals (Young's modulus) largely control and anticipate their deformational behaviour during tablet compression. Young's modulus (E) and indentation hardness (H) represent valuable and effective tool in preformulation studies for describing materials' mechanical attributes, which are important for technological processes in which materials are exposed to deformation.

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Smoking as a Risk Factor in Patients with Cardiovascular Diseases and the Development of Preventive and Curative Standards

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This Article presents a review of the effect of smoking on the body activities, in particular: effect of smoking on the development, prognosis, ongoing of the coronary heart disease. There were analyzed the results of pathophysiological and clinical studies on the effect of smoking on the coronary blood flow and vascular endothelial function, the results of scientific works on the effect of drugs on endothelial function and the risk of developing cardiovascular diseases and complications in smoker patients were brought.

It has been established that the angiotensin converting enzyme-quinapril inhibitor has the greatest means for tissue renin-angiotensin-aldosterone system; the effect of quinapril on endothelial function in smokers and nonsmokers convincingly demonstrates the existing differences between smoker and nonsmoker patients. After 6 months, patients who received quinapril experienced an improvement in performance compared with placebo. After 6 months, the nonsmokers who received the placebo had no changes in the vascular response, while in the nonsmokers receiving quinapril significantly weakened the response of the vasoconstriction. In the smokers who received placebo, increased vasoconstriction reaction, while those who received quinapril received a significant reduction in vasoconstriction.

Thus, the number of smoking patients suffering from coronary heart disease, the absolute ineffectiveness of verbal propaganda for the harm of smoking, raise the issue of developing a standard for conducting smoking patients, with regard to the feasibility of primary and secondary prevention.

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Part of Virtual CT Colonoscopy in Colon Disease Diagnostics

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Colorectal cancer is a huge problem for the world for its spreading and lethality as well as for great expenses related to this disease.

Nowadays virtual colonoscopy is one of the basic methods for colon disease diagnostic in the USA and Europe. In some countries, this method is included in colorectal cancer screening program. In Georgia, mentioned method is used rarely despite of its high diagnostic potential.

The current research aims to populate virtual CT colonoscopy to be widely used in diagnostic as well as preventive healthcare, study virtual CT colonoscopy potential in colon pathology diagnostic, develop radiological semiotics of colon specifications and pathology changes (tumors, diverticulosis, colon inflammatory disease, etc.) during virtual CT colonoscopy.

The research has been carried out in Batumi Referral Hospital, where virtual CT colonoscopy is implemented into clinical practice, is actively used and becomes more and more popular day by day.

During the clinical researches patient's complains were gathered in details, also, there was considered life, medical history and clinical research data. Following instrumental methods were used: virtual CT colonoscopy, fibro colonoscopy, irrigography, irrigoscopy, ultrasound examination of colon.

Computer Tomography research was carried out on General Electric 16 layer CT scanner with 1.2 mm step by following phases: definition of research indication, preparation of intestine, insufflation, getting image, working on image and interpretation. In all cases intestine was filled up with common air by manually method.

According to 53 patients examination results in colon growing anomalies diagnostic virtual CT colonoscopy responsivity is 98,1%, specificity 100%, diagnostic accuracy 98,1%, diverticulosis diagnostic 94,3%, 96,2%, 95,3%; and in polyps diagnostics 90,5%, 84,9%, 87,7%, correspondingly.

Based on the obtained results, it can be concluded, that virtual CT colonoscopy is a reliable, high informational and minimally invasive diagnostic method to discover pathological changes in colon wall. It is a topical national question of our oncology and radiology to popularize virtual CT colonoscopy in diagnostic, also achieve a wide implementation in preventive healthcare and smoothing virtual CT colonoscopy method.

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Healthy environment is a guarantee of life enhancement

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Living in safe and healthy environment is one of the basic human rights. The protection of this right is an important prerequisite for the health, welfare and sustainability of the population. Unfortunately, environment around the world, including Georgia, is suffering from acute ecological crisis. The Third Millennium is characterized by the greatest achievements of material-technical progress, which is a sign of great success for mankind. It simplifies the living environment on the one hand and on the other hand deteriorates ecological situations and causes new problems for health. Environmental risk factors for human health include: polluted air, water and soil; ultraviolet radiation; noise and electromagnetic field; climate change caused by human impact; ecosystems change, etc.

Today, we have to work and live where radiation is contaminated twice, three times, a thousand times more than permissible norm.

Dangerous sources of atmospheric pollution are: industrial, transport and household emissions. Atmospheric air, drinking water and open water reservoirs, toxic substances of soils and foodstuffs, pesticides, heavy metals and other contamination. The atmospheric pollutants are distributed unevenly, and in some cases their number is very high. Car fuel exhaust, dust produced from constructions, the dirt coriander, the colorful "parked" trees, the bunker of the uninterrupted entrances, etc. - That's all the problems we are creating ourselves. In addition, even the insignificant concentration of some substances in the atmosphere is particularly dangerous.

According to the World Health Organization data, it is possible to prevent the death of 13 million people every year by maintaining a healthy environment. Environmental factors directly or indirectly affect 85 out of 102 categories of diseases and traumas in the World Health Report. According to World Health Organization 2012 World Health Organization, the expected duration of life expectancy in Georgia was an average of 74 years and Georgia was ranked 89th in the world ranking. While the ratings of the leading countries in Switzerland and Japan, the expected duration of life reached 83 and 84 years. Consequently, each of us is obliged to realize these things and to take decisive measures in time. A person should listen to environment as if listening to his own heart rhythm, otherwise, irreversible processes in nature will be violated and the planet Earth will not be able to provide vital conditions for humans. The environmental protection implies all the measures aimed at maintaining the vital bases of human and nature and to eradicate existing environmental damage.

Government is obliged to take care of ecological improvement of the environment. The school can play a special role, since raising a civic consciousness starts at school. Society should be aware since the early age how to protect the environment from harmful effects. It was Vazha Pshavela's heartbeat a century ago, which is actual and unsolved even today. "Nature is the ruler, it is a slave and sometimes it's good, sometimes cruel". We should not stop for long periods in areas where the atmospheric air is polluted. We should try: not to use open water reservoirs or vessels for washing ourselves or dishes, or drinking it. At the same time we should use ecologically clean foods, should not stay long in the sun without a hat because it can cause sunscreen. We should control the air temperature and humidity in the flat; should not contaminate the environment with the tobacco or other kind of bolster and chemicals against insects and parasites. The report presents recommendations about environmental protection.

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National Drug Policy and Pharmaceutical Education in Georgia

Goals of the National Drug Policy. The goals of the policy shall be to make available at all times to the populace adequate supplies of drugs that are effective, affordable, and safe and of good quality; to ensure the rational use of such drugs; and to stimulate increased local production of essential drugs.

Research Method – competitive analysis.

The objectives of the policy are: i. To ensure efficient and effective drug management in the public and private sectors; ii. To ensure access to safe, effective, affordable and good quality drugs at all levels of health care on the basis of health needs; iii. To promote the rational use of drugs by prescribers, dispensers and consumers; iv. To increase local drug manufacture/production and promote export; v. To ensure that all drugs in the national drug distribution system are safe, efficacious, effective and of good quality; vi. To strengthen administrative, legislative, and regulatory controls of the importation, manufacture, procurement, storage, distribution, supply, sale and use of drugs; vii. To promote research on herbal remedies and integrate those found to be safe and efficacious into the health care system; viii. To promote pharmaceutical research and development of raw materials for the production, compounding and formulation of pharmaceutical products, as well as operational research for the effective implementation of the National Drug Policy; and ix. To enlist government commitment at all levels for the achievement of the goals and objectives of the National Drug Policy.

As a **result**, the strategies that shall be used to implement the National Drug Policy shall focus on effective drug management processes, such as rational drug selection, proper quantification of drug needs at all levels of health care delivery and effective procurement practices. Others shall include assurance of quality of drugs at all levels, appropriate storage, proper costing and effective distribution of drugs, promotion of local drug manufacture, appropriate legislation, product registration, research and development, human resources development, monitoring and evaluation. Furthermore, the strategies shall emphasize proper accountability and rational use of drugs by health workers and consumers.

Conclusion: The National Drug policy in Georgia is not formulated according to the recommendations of WHO and it creates problems for pharmaceutical education in universities, as well.

In view of the fact that these activities are purely technical, government at all levels - federal, state and local governments, shall be required to employ pharmacists and other relevant personnel to ensure satisfactory implementation of the Policy

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Impact of Oncological Disease and Treatment Methods on Oral Cavity.

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Introduction: health-related quality of life is considered as one of the leading problems of medicine today. Quality of life of patients suffering from definite disease at the final stages of their life, is of special concern. Special attention should be paid to the oncological palliative patients, who have changes in whole body and in oral cavity also (that is not exception). Oral symptoms can create big problems; it can disturb normal adequate communication and food intake ability, which lead to isolation from society and deep depression and as a result the food intake problem- low performance status.

Aim: aim of our research is to define the changes that appear in oral cavity of Georgian palliative oncological patients under the palliative care and to create new model of palliative care.

Methodology: methods used in research are face-to-face interview of patient, history taking with filling special questionnaires.

Results: according to small database, that was received from the palliative patients of Batumi Oncology Center, studying their oral cavities, all the patients have similar changes. Changes can be at least one or more.

Conclusion: according to the present problems quality of life suffers, but it can be improved with early stomatological intervention. Dentist must join palliative team that is what we try to prove.

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Fragile X syndrome: diagnostic yield and utility

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Introduction: Fragile X syndrome (FXS) is the most common genetic cause of autism spectrum disorders (ASD), as well as most common cause of inherited intellectual disability (ID) and developmental delay (DD). It is second after Down syndrome among all causes of intellectual disability in males. Prevalence of FXS is estimated to be 1:2000 in boys and 1:4000 in girls. About 30-40% of FXS patients exhibit ASD (42% of males and 23% of females) and it accounts for 2-3% of all ASD. Other common behavioral features of FXS include delayed motor and cognitive development; attention deficit and hyperactivity disorder (ADHD), learning disability of various degrees and other behavior problems. Physical features of FXS include long face and large prominent ears, prominent forehead and lower jaw, macroorchidism and hypermobile joints.

Most cases of FXS are due to CGG trinucleotide expansion in the 5' untranslated region of the X-linked *FMR1* gene leading to the methylation and silencing of the gene. There are four allelic forms of the CGG repeat length: full mutation (>200 repeats), premutation (55 to 200 repeats), gray zone (45 to 54 repeats) and normal (5 to 44 repeats). Males who have >200 repeats will be always affected but about half of full mutation carrier females will be affected. A woman with a premutation allele has an increased risk for having affected full mutation children with greater than 200 repeats. Carriers of premutations can develop an adult-onset neurological disorder of cerebellar dysfunction and neurological deterioration, known as the fragile X-associated tremor/ataxia syndrome (FXTAS). In addition, approximately 30% of female carriers of premutations will develop primary ovarian insufficiency (POI), premature ovarian failure (POF), irregular menses and elevated FSH levels by the age of 40 years. A woman with an allele in the intermediate region (45-54 repeats), has an increased risk for having children with a premutation allele; these children are not at risk for Fragile X syndrome. People who have normal repeat length are not affected and they don't have the risk to transmit the disease to their children. Of note, the incidence of premutation carriers is 1:200-1:400.

Methods: There are different methods for the diagnosis of FXS. In previous years, Southern blot was widely used for the diagnosis of full mutation alleles, but it is not accurate with detecting exact size of premutation alleles and is laborious and time-consuming. Methylation test is also widely used for distinguishing fully expanded alleles from premutation/normal range alleles, but it cannot detect the repeat size of the premutation or gray zone alleles. Recently various PCR-based methods have been developed that enable the sensitive, rapid and cheap diagnosis of FXS with accurate estimation of the repeat size in the premutation and gray zone allele range, as well as distinguishing full

mutation from unexpanded alleles with almost 100% sensitivity and specificity. Thus, FXS test is the most commonly asked genetic test worldwide.

Conclusion: FXS requires consideration in the differential diagnosis of all ASD, ID and DD both in males and females of all ages. *FMR1* testing should be offered to women with POI and POF associated with elevated basal FSH levels and to those over 50 years exhibiting intention tremor, ataxia, memory loss, and cognitive decline and personality changes. Thus, genetic testing for FXS mutations is important at all life stages, prenatally to adulthood, not only for the diagnosis of the affected patient, but also for determining the genetic status in other asymptomatic family members, who might be at risk of having affected children.

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Influence of Visible Spectrum of Household LED on the Heart Rate Autonomic Regulatory Mechanisms

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The purpose of the research was to evaluate autonomic nervous system regulatory mechanisms of healthy population in the conditions of application of blue color LED.

Initially 25 healthy 19-22 year old volunteer males with black and chestnut hair were selected.

The source of electromagnetic radiation was the IP 66 LED Outdoor Light, with illuminating intensity of 50W and gave the white and blue (monochromatic) light flow switched by means of the remote control.

The variation of heart rhythm was studied by the Hungarian manufacturing Holter app, with standard software allowed us to get the following statistical indicators: mean RR interval mean HR, SDNN standard deviation, RMSSD-dispersion. We studied autonomic nervous system regulatory function with stress index (SI).

Spectrum analysis separated three frequency ranges: a) high frequency - respiratory waves – High Frequency (HF), B) low frequency range (the so-called first slow waves) - Low Frequency (LF), C) Very low frequency range (second row slow waves) - Very Low Frequency (VLF) and their derivatives. Centralization Index (Index of Centralization - IC), Vago-sympathetic ratio Index (LF / HF).

Irradiation of the occipital and parietal parts of the head was performed in three stages: consequent 20 min long irradiation sessions with white, blue and again white light.

The distance was selected taking into account that illumination (*in vivo*) should be similar to conditions of experiment specifically: distance between the object and white color source was up to 23 cm, and the blue color – 36 cm. It should be noted that the white and blue color LED does not have heat radiation.

Literature review, previous research and the obtained results allow us to conclude that the effects of electromagnetic radiation of the blue color of the blue LEDs affect the skin and hair as well as. It increases the concentration of free radicals and leads to moderate tension of the general vegetative regulatory mechanism.

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Absorption and Transportation Characteristic of Periwinkle Alkaloids and Oral Delivery by Tetraether Nanolipid Vesicles

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Introduction and aim: Vinca alkaloids are a subset of drugs obtained from the periwinkle plant and used to treat different type of diseases. Multidrug resistance (MDR) is a phenotype of resistance limiting oral bioavailability of these compounds through enhanced membrane efflux and is associated with overproduction of a 170-Kd membrane glycoprotein. To overcome this hurdle, new formulation strategies are proposed as carriers to improve their bioefficacy, highlighting the use of lipid-based delivery systems. The aim of this study was to investigate the absorption and transportation characteristic of a mixture of four ajmaline alkaloids in human intestinal epithelium and to improve of oral delivery by a novel type of liposomes containing tetraether lipids (TELs) derived from archaea bacteria. Sum of alkaloids were obtained at the TSMU Pharmacochimistry Institute from Vinca herbaceae Waldst et, Kit growing and cultivated in Georgia, and proposed for the treatment of cardiac arrhythmia.

Methodology: Caco-2 (human epithelial colon adenocarcinoma) cells monolayer was used as a model system for intestinal absorption. The permeability of four alkaloids from apical side (AP) to basolateral side (BL) or from BL side to AP side was studied in the presence and absence of specific P-gp inhibitor (verapamil). The concentration of alkaloids was measured by HPLC coupled with UV detector. Transportation parameters and apparent permeability coefficients (P_{app}) were calculated.

The liposomes containing crude extracts of vinca alkaloids were prepared by thin-film dispersion method, the effect of process parameters and composition of materials on the entrapment efficiency of the main components were studied. The stability of the liposomes dispersion was also evaluated.

Results: The P_{app} values of two compounding alkaloids in the bi-directional transportation were quantitative degree of 1.0×10^{-5} cm x s⁻¹ and 1.0×10^{-6} cm x s⁻¹ and exhibited time - dependent permeation. Reduced secretory (basolateral to apical) permeabilities of another two alkaloids in the presence of verapamil suggests the involvement of an active, transporter-mediated secretory pathway. In the presence of inhibitor, secretory permeability of these alkaloids decreased (86.5 % and 73.5%) while the absorption transport increased (70.91%).

The liposomes made by thin-film dispersion method were mostly small unilamellar vesicles and their particle size was 200 nm to approximately 250 nm, as confirmed by photon correlation spectroscopy; the polydispersity index was less than 0.4; The optimum entrapment efficiency of the alkaloids were more than 65%. The liposomes dispersion was stable when kept at 4°C. In vitro drug release study showed sustained drug release behaviour over a period of 48 hrs.

Conclusions: These findings, together with our previous work suggest that P-gp/MDR-mediated efflux of ajamailine alkaloids may contribute to the low oral bioavailability, which might be improved by encapsulation of these compounds into TEL-liposomes. High drug encapsulation efficiency and small vesicular size could enhance the oral bioavailability of alkaloids.

In combination with long-term storage stability and controllable sustained release, this formulation appears to be a promising therapeutic approach for heart failure.

Tsitsilashvili E., Kurtanidze M., Karukhnishvili N., Ghudushauri N.

A novel look at GMP EU and changes implementation in pharmaceutical companies

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As the main tool to ensure quality, safety and efficiency of pharmaceutical products the first GMP was issued in USA (1963) [4]. Nowadays next to US FDA GMP Guidelines there are Australian, Canadian, European Union, World Health Organization and other GMP Guidelines that are often referred to as cGMPs (current good manufacturing practices) [6]. EU GMP is comprised of three main part, two of which (Part I and Part II) have legislative power, while Part III (GMP related documents including ICH guidelines Q9 and Q10) have recommendatory character. However, the new trend observed in the latest years is that Part I and Part II are getting harmonized with the Part III: Changes in Chapter 1, Chapter 2 and Chapter 7 from the Part I have been made in order to align with the concepts and terminology described in the ICH Q10. Furthermore, most of the chapters are revised to include QRM principles that are described in the ICH Q9 [3]. In the company Aversi-Rational Ltd it is well noted that „science is no longer isolated; it’s living across the lifecycle of the product/process within a QMS” [5] and because of that according to the new requirements QRM system is applied through the lifecycle of the product/process as the main enabler of QMS. On the 1 March of 2015 amendments to the text of Chapter 8 was enforced to insure that QRM principles are also applied when investigating quality defects or complaints [2], correspondingly Aversi-Rational Ltd uses different tools of QRM in non-conformities’ investigation. Another improvement of the QMS that is implemented in the company in accordance with the update of Chapter 4, is application of the 1 C Pharma System electronic programme that is validated and ensures data integrity of each process important for product quality [1]. As the concluding remark, it should be mentioned, that pharmaceutical companies must clearly comprehend that the only way to produce high quality product is to keep their QMS up to date in accordance with the constant changes of different recommendations and directions issued by world’s leading regulatory organs.

Abbreviations:

FDA - Food and Drug Administration

GMP - Good Manufacturing Practice

QRM - Quality Risk Management

QMS - Quality Management System

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Tushurashvili P., Kutkhashvili M., Chorgolashvili D.

Possibility of Tandem Mass Spectrometric Analysis for Amino Acid Disorders in Dried Blood Spots and Urine Samples in Georgia. Pilot Study

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Introduction:

The analysis of newborn's blood samples for various inborn metabolic disorders is a powerful tool to keep the human population healthy and to save the national budget from unnecessary expenses that otherwise would occur.

A powerful tool for the identification of different inborn metabolic disorders is the usage of tandem mass spectrometry. Until now, it was impossible to analyze inborn metabolic disorders using tandem mass spectrometry in Georgia and it is still necessary to send blood samples to different foreign laboratories. This practice is expensive and constrains rapid and proper newborn screening in regard to metabolic disorders. The aim of this pilot study was to demonstrate to the Georgian Medical Society, the ability of the National Forensics Bureau to solve newborn screening problems for the identification of metabolic disorders.

Methods

The mixture of eight amino acids (Alanine, Valine, Leucine, Glutamine, Methionine, Phenylalanine, Arginine and Tyrosine) was analyzed on Agilent 6460 Triple Quad LC-MS/MS using three different modes – Scan, Neutral Loss and MRM. Randomly chosen human blood and urine samples were analyzed for eight different amino acids.

Results

The comparison of obtained results clearly demonstrate, that the usage of Scan and Neutral Loss modes gives almost the same uncertain picture, which is useless for fast and accurate identification of target amino acids.

In contrast, analysis in MRM mode gives clear resolution and thus a possibility to identify and quantify target amino acids.

Conclusions

LC-MS/MS analysis of blood and urine samples in MRM mode is fast, cheap and reliable for the identification of free amino acids.

Furthering the cooperation of Pediatric Clinics with the National Forensics Bureau can turn the screening of newborns in regards to inborn metabolic disorders to a fast and cheap alternative compared to the methods traditionally used.

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Development of Regional Health Care System in Georgia

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Introduction: Georgia is a country in the Transcaucasus, has a population < 4.5 million people of which 56% is urban and 44% rural. It covers an area of 69,000 square kilometers. Georgia became an independent republic in 1991 following the collapse of the Soviet Union. Prior to independence Georgia enjoyed one of the highest living standards. Health services, like many other forms of production, can be implemented in more dispersed or more concentrated configurations, or in hybrid arrangements that combine some concentrated with some dispersed elements. Health services aim to protect or improve health. Whether they do so effectively depend on which services are provided and how they are organized. Resources should be used for interventions that are known to be effective, in accordance with national or local priorities [1]. Dispersed service configurations are usual for activities which do not benefit from economies of scale – unit costs are no lower for large than for small production units – such as primary care, including the integrated management of childhood illness; pharmacies; dental offices; field-based implementation of public health programs; counselling; social work; and community and home-based care[2].

Aim: Analyses of Health Services development for regional population and deferent social groups.

Methods and Materials: expert analysis of development of medical services in Georgia, survey review of statistical and financial information.

Results and discussion: Improvements in efficiency and effectiveness enable a health system to deliver more services and achieve better health outcomes using existing resources. Improving the effectiveness of services and productivity of health providers is a way to achieve these objectives. Health systems also need to ensure a holistic approach to services, involving health promotion, disease prevention and integrated disease management programs. They should also coordinate services among levels of care and a variety of providers, institutions and settings. The three subdimensions are the improvement of coordination between levels of care; the improvement of hospital efficiency and effectiveness; and the improvement of staff productivity [4].

Conclusion: What is the future? Continued growth & funding in health promotion campaigns

Create vertical & horizontal health systems, Creating a “one-stop-shop” for healthcare, especially in rural areas (PCHCs), Standardization of Care ♦ Models of Care, Increased physician training, National Health Information System, Training in data collection & how to use that information (strengthen epidemiology practices), Increase private insurance coverage, Low cost primary care, payment for complimentary care.

Zarnadze N., Chitanava J., Dolidze K., Varshanidze N., Gamkrelidze Kh.

Morphogenesis of *Aerva Lanata* in *In Vitro* culture

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Pol pala is a one-year, juicy grass plant with unique medicinal properties. It is currently widely required around the world. Pharmaceutical companies collect it historically and cultivate especially. Therefore, it is important to create selection and nursery sites of this culture for manufacturing as well as for science. Genetically multifarious selection and nursery materials are received these days by more popular and famous nanotechnology – cell culture.

Research object was secondary explant from Pol pala *in vitro* cultivated material – leaf plate, of which 3-5 mm size fragments were placed for callus induction in nutrient mediums containing different composition of naphthylaceticacid and indolebutyricacid (2, 5, 10, 15 mkm) and same composition of benzylaminopurine (1 mkm) auxins. Cultivation was processed in thermostat on $27\pm 2^{\circ}\text{C}$ temperature and it was subcultivated in every 3 weeks. Half of received calluses were conveyed on the same nutrient medium and the other half was placed on morphogenetic nutrient medium, in which the composition of citocinina was more than auxin's one. The frequency of morphogenesis was determined in percentage by correlation between the numbers of morphogenetic structured explants and the numbers of analyzed explants.

The tissue of leaf plate of Pol pala was more callusogenic. Both used auxins made induction on callus and growth indexes was increasing proportionally to composition, but morphogenetic potential was different. Callus tissues produced with naphthylaceticacid made stem morphogenesis induction and calluses with especially high concentration (10-15 mkm) of indolebutyricacid made stem morphogenesis induction as well as rhizogenesis. This kind of cultures were annulling in process of experiment.

Calluses in the organogenic nutrient mediums had the following changes:

1. Half of them continued growing slowly, vacuolated cells became solid and green color
2. Some of them continued growing without revealing morphogenetic potential and they got green color
3. Some of callus tissue made root induction
4. Some of them gave only a single regenerate
5. Some of them developed morphogenetic nodes, which were not realized as a consummate plant
6. Most of callus tissue, approximately 80%, gave massive regeneration.

Low composition of BAP (5 mkm) was conditioning organogenesis of low frequency. Increased composition (10-15 mkm) strengthened developing organ structures and buds fertilized in callus. Furthermore, regeneration index was maximal and alongside new morphogenetic nodes appeared.

Adding NAA of composition 1mkm to BAP in nutrient medium conducted intensive regeneration process and produced buds were characterized by good growth and development.

Thus, the ways of producing morphogenetic callus tissues and realization of morphogenetic potential and the behavior of these processes on the nature and composition of phytohormones were elaborated.

Zarnadze Sh., Zarnadze I.

Global Climate Change and Sports Nutrition

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Introduction: The field of nutrition is a dynamic one. Ask their trainers, physiologists, coaches, doctors, and dietitians for guidance related to what to eat and which supplements to use. Registered Dietitians have choices to work within clinical dietetics, nutrition support, research, outpatient or private counseling, consulting to the food industry, consulting to the supplement industry, direct food or supplement industry employment, in product development and many other economical beneficial areas

The field of sports nutrition is a dynamic one. Core competencies in exercise physiology, psychology, integrated metabolism and biochemistry are the initial parameters for a successful career in sports nutrition. In addition to the academic fundamentals, it is imperative that the sports nutritionist understand the sport in which our client participates. This sport specific understanding should manifest itself in fuel utilization, mechanics of movement, as well as psychological processes that motivate the participant to perform optimally.

Aim: Historical overview of the understanding of the importance of good nutrition.

Methods and Materials: Statistical review, Governance reports, Expert analyses-more 50 experts-respondents. Expert analyzes of development documents, Problems in Georgia.

Results and discussion: The last ten years has seen the largest advancement of sports nutrition, with the following areas driving much of the research: the effects of exercise on protein utilization, meal timing to maximize the anabolic response, the potential for ribose to benefit those engaged in high-energy repetitive sports, and creatine and its uses within athletics and medicine. The future of sports nutrition will dictate that we 1) collectively strive for a higher standard of care and education for counseling athletes and 2) integrate different disciplines. We are in an era of unprecedented growth and the new knowledge is constantly evolving.

Sports nutrition is often considered within the field to have divergent thought leaders. We know that since the science is evolving and that not all keep up-to-date with the latest publications (journals or texts) that not all of us are on the same advising page. Perhaps, controversy is good. If we all were of the same opinion, than what would be the motivation

for progress and the pursuit of new knowledge? Take for example, the intense arguments that occur just over the protein needs of athletes as compared to sedentary folk as well as anaerobic versus aerobic athletes. This in and of itself drives the sales of many books and magazines. However, one needs to be cognizant that athletes often view food as one means of obtaining their goals, while ergogenic aids at times are believed to be the missing link, which will propel the athlete's performance over the competition. In this situation, knowledge about the safety and efficacy of ergogenic aids is paramount in truly helping your clients.

The following areas of nutrition are where the most growth is occurring: evaluating the effects of exercise on protein utilization, thus the overall protein needs; meal timing to maximize the anabolic response; the true "essentiality" of essential amino acids; the potential for ribose to benefit those engaged in high-energy repetitive sports (i.e., football lineman); and creatine and its use within athletics and medicine.

Recent popular literature has been noted for promoting the pentose, ribose, as a dietary supplement. In fact, many patents and patent-pending filings exist for the uses of ribose in athletics and medicine. Ribose is a carbohydrate, or sugar, used by all living cells and is an essential component in our body's energy production. The company who holds the ribose patents claims the following on their website: "Ribose is essential in helping the body restore its cellular energy level.

Conclusion: The future of sports nutrition will dictate that we collectively will have to have a higher standard of care and education for counseling, whether individually or in groups. The integration of many different disciplines (physiology, metabolism, psychology, etc.) will become a minimum mandatory set of disciplines for any aspiring sports nutritionist.

Poster presentations

Abstracts

P1. Abashidze N., Chaidze F., Kalandia A.

Bioecological Peculiarities and Content of Essential Oils of the Plants Introduced at Batumi Botanical Garden

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The plants of various geographical origins existing in Batumi Botanical Garden has always deserved special attention and interest.

According to the academician Boris Keller (1874-1945), the Batumi Botanical Garden represented a valuable scientific base for the scientists working in various fields of botany,

The study of ecophysiological and biochemistry peculiarities and features of introduced plants of various geographical origins is still continuing at the Botanical Garden, as well as one of the theoretical basics of plant introduction in order to reveal new plant resources and implement them in different types of farming economy.

New age brought new challenges-despite the development of synthetic substance production, the importance of applying aromatic plants containing essential oils in pharmaceuticals, food and perfume industry is still great.

The objects of our study were the exotics: *Leptospermum scoparium* Forst; *Leptospermum scoparium* var. *Chapmanii* Dorian. Smith; *Leptospermum scoparium* var. *nichollsii* Turill.; *Lindera communis* Thunb.; *Illicium verum* Hook. F.; *Illicium floridanum* Ellis. *Doryphora sassafras* Endl. *Michelia figo* Lour. In the objects of our study for determining the content of essential oils, we have conducted experimental research in the regional chromatographic center of western Georgia. For the isolation of essential oils the methods of hydrodistillation, high-pressure super-fluid extraction (with inert gases) and titration have been applied. As a result of hydro distillation of *Leptospermum scoparium* leaves, *Leptospermum scoparium* var. *Chapmanii* leaves, *Leptospermum scoparium* var. *nichollsii*

Leaves, Lindera communis Seeds, Illicium verum leaves, Illicium floridanum leaves we obtained distillates with peculiar aroma. The research enabled to confirm the presence of essential oils in this species. Through the titration method (hydrolysis of essential oil glycoside link in leaves and fruit was conducted with hydrogen chloride and the free essential oil was titrated with bromine). It was determined that the content of essential oils in the *Illicium verum* leaves is 0,0657%, in *Lindera communis* fruit - 0,5474%, *Illicium floridanum* fruit - 0,0497, *Doriphora sassafras* leaves - 0,124%, *Michelia figo* flowers – 1,078%.

Some medicinal and aromatic plant species introduced at Batumi Botanical Garden take a significant place in terms of their application in medicine, perfume industry and can widely be implemented in modern pharmacology and perfume industry. According to their adaptation degree, the studied plants can be recommended for the reasonable application at Adjara coastline.

P2. Arziani B.¹, Barbakadze Kh.^{1,2,3}, Brostow W.³

Antimicrobial Covers Based on Organometallic Complex Compounds and Industrial Organic Polymers Modified By Silicon-organic Functional Oligomers

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Keywords: cultural inheritance, polymer composites, sliding wear, polymer friction.

Degradation of various art works (historic monuments, archeological patterns, museum exhibits, etc.) is the result of a delicate balance of aging, microbial pollutants, environmental conditions and wrong previous restoration treatments. Thus, development of novel more efficient materials and further improvement of restoration performance formulations have been significant interest of the scientists aiming to rescue the cultural inheritance and environment as well.

For providing antimicrobial protection of cultural heritage, we have used silicon- and fluorine-organic matrices with side epoxy groups and industrial polymers. As plasticizer modifiers, we used polyorganosiloxanes with terminal functional (hydroxy-, amino-) groups at silicon atoms in order to improve elasticity, thermal stability, hydrophobicity, formation

of homogeneous films and adhesion to the various substrates. As bioactive components we used hybrid heterometal coordination compounds containing organometallic [bis (η^5 -cyclopentadienyl) iron] and carbocyclic (tricyclo-[3.3.1.1^{3,7}]-decane/adamantane) fragments.

DSC diagrams show the beta transition regions of tested composites in the temperature range from -33°C to -43°C. All hybrids show the resistance to thermal degradation with weight loss of between 18-37% in the range of 420-440°C.

The modification mainly causes gradual decrease of sliding wear resistance with respect to pure polymers, improvement of viscoelastic recovery (75-90%), lowering of dynamic friction and also increasing of hydrophobicity. Progressive scratch testing with linearly increased load (1.0 N - 30.0 N) results show that the modification does improve scratch resistance - depending on the modifier type and its quantity - for most hybrids with respect to pure polymers. Surface morphology (SEM) and tribological properties after aging (70°C, 10 days) show an improvement of scratch resistance and dynamic friction. Thus, our modifiers and bioactive components provide both lower friction and a higher scratch resistance.

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P3. Azizova G.I.¹, Yıldız L.Z.², Topchiyeva Sh.A.³

Influence of the Thiol Status of the Organism on the Secretion of Antimicrobial Peptides in the Hereditary Blood Diseases

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Key words: carbonylated proteins (CB), thiol status, defensin

Among the diseases of the blood, thalassemia occupies a special place, associated with a reduction or complete absence of synthesis of globin chains of hemoglobin. Azerbaijan is considered to be an endemic zone of these inherited blood diseases, which makes research conducted on the problem relevant.

The objective: Studying the relationship between thiol status of blood and the secretion of endogenous antimicrobial peptides.

Materials and methods. The blood of 57 patients aged 6-17 was studied. The control group consisted of 10 healthy children of the same age. All patients, in dependence on pathology, were divided into the following groups: group I - 20 children with homozygous β thalassemia, II group - 37 children with G6PD deficiency. In order to assess the degree of oxidative stress of the organism, carbonylated proteins and thiol blood status were chosen as markers. In order to assess the level of secretion of endogenous antimicrobial peptides, a quantitative analysis of defensin in blood plasma was performed by the immunoassay method Fermental analysis (ELISA). The researches were conducted at the chair of biochemistry of the Azerbaijans Medical University with the financial support of the Science Development Foundation under the President of the Republic of Azerbaijan.

Results: As a concequent result of the work done, it was revealed that in the first group of patients the amount of carbonylated proteins was increased by 11%, in the II group of patients, CB increased by 1.6%, thiol status decreased by 1.5%, in group III, the amount of CB increased by 13%. Ationic status decreased by 17%. The level of defensin in group I increased by 2%, endotoxin by 1.7%.

In the II group, these indicators were increased by 1.7% and 2.3%, respectively, compared with the control. The data obtained indicate an increase in the effect of oxidative stress on the body. On the background of changes in the thiol status and endotoxin of the organism, the secretion of - defensin increased. Thus, in I group of patients the level of defensin was 130 ng / ml (at a rate of 100 ng / ml), in II group this index increased by 1.8 times.

Conclusions: At β -thalassemia, carbonylated proteins increase, thiol status decreases in blood, which indicates an increase in the influence of oxidative stress associated with frequent infectious complications and activation of neutrophils.

P4. M. Benidze, A. Skhirtladze, V. Nebieridze, E. Kemertelidze

Chemical Composition of the Flowers *Yucca gloriosa* L. Cultivated in Georgia

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The evergreen, plentifully blossoming wonderful decorative shrub of *Yucca gloriosa* L. has been the subject of our investigation for some considerable time.

Steroidal sapogenin – tigogenin from the leaves of the plant is considered as a suitable raw material for the synthesis of the steroidal hormonal preparations. At the Iovel Kutateladze Intitute of Pharmacochemistry agrecommendations were established and 150 ha plantations have been set up in the Eastern Georgia (Shiraki field). Based on steroidal saponins from the flowers the effective plant growth stimulant - Alexin was obtained. By the treatment of the agricultural plant seeds before sowing or spraying plants with weak solutions of Alexin the germination capacity and speed of shooting are enhanced, finally crop capacity is considerably increased [1,2].

For the study of chemical composition from alcohol-water extract of the flowers by repeated chromatography was isolated and identified: 6 spirostanol and 2 furostanol glycosides derivatives of tigogenin, smilagenin and gitogenin; phenolcarboxylic acids –*p*-hydroxy benzoic, *p*-coumaric and ferulic; flavonoidal glycosides – rutin, isorhamnetinrutinoside and kaempferolrutinoside; three new nerolidol type sesquiterpene glycosides.

The structures of isolated individual compounds were established on the basis of physical-chemical data and modern spectral methods of analyses such as one- and two dimensional NMR spectroscopy (¹H, ¹³C, HSQC, HMBC, COSY) and mass-spectrometry (ESI/MS).

Sesquiterpeneglycosides in the species of *Yucca* L. are described for the first time.

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P5. Beridze M.

Sea buckthorn (*Hippophae rhamnoides*) - Biochemical Peculiarities and Phytochemical Content in the Conditions of Chorokhi Delta

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Hippophae rhamnoides- also known as common Sea Buckthorn is a species of flowering plant in the family Elaeagnaceae, native to the cold-temperate regions of Europe and Asia. It is a spiny deciduous shrub. The plant used in the food and cosmetic industry, in traditional medicine, as animal fodder and for ecological purposes as well. *H. rhamnoides* is a deciduous and hardy shrub of between 2 and 4 m high. It has a rough, brown or black bark and a thick, grayish-green crown. The leaves are alternate, narrow and lanceolate, with silvery-green upper faces. It is dioecious plant. *H. rhamnoides* is divided into eight subspecies: *ssp. carpatica*, *caucasia*, *fluvialis*, *mongolica*, *rhamnoides*, *sinensis*, *turkestanica* and *yunnanensis*. These subspecies vary in size, shape, number of main lateral veins in the leaves and quantity and color of stellate hairs. They also have different areas of distribution and specific utilizations. It is found in a variety of locations: on hills and hillsides, valleys, riverbeds, along coastal regions, on islands, in small isolated or continuous pure stands, but also in mixed stands with other shrub and tree species. In Georgia, sea-buckthorn found in Imereti, Racha-Lechkhumi, in Adjara, it is spread in Gonio, Erge, Tkhillnari. *H. rhamnoides* is widely used as traditional medicinal plant. The leaves are used

as a herbal medicine to alleviate cough and fever, pain, diarrhea and general gastrointestinal disorders as well as to cure dermatologic disorders. Similarly, the fruit juice and oils can be used in the treatment of liver disease, gastrointestinal disorders, chronic wounds or other dermatological disorders. *H. rhamnoides* fruits have also been used internally as tea, juice, or syrup for treatment of infections, colds, and flu. Various pharmacological activities such as cytoprotective, anti-stress, immunomodulatory, hepatoprotective, radioprotective, anti-atherogenic, anti-tumor, anti-microbial anti-ulcerogenic and tissue regeneration have been reported. Sea buckthorn is included in Georgia and former Soviet Union "Red Books" as disappearing species.

The aim of the study was to research the biochemistry of populations of Sea buckthorn, the condition and development dynamics in the Chorokhi delta, Gonio, Erge, Tkhilnari. The goal was to determine the percentage of oil in different forms of Sea buckthorn fruit.

Field studies conducted by a traditional route expedition method. We studied different forms of populations in the Gonio Valley and the rivers locality in the village of Erge. We processed the data in the botany's office of the department of Biology. We conducted phenological observation with technique methods of A.P. Shennikov.

We divided into two forms of Sea buckthorn: Form 1 - with frequent thorny and Form 2 – with Sparsely thorny. Based on the phytochemical analysis produced on ripe fruits, we found that the fruits in both forms do not differ significantly in the amount of fats, the content of fats was 6.5-6.8%.

On the basis of the observation, the significant difference between the two forms of Sea buckthorn was not revealed. Sea buckthorn in the Chorokhi Delta is destroyed by anthropogenic impact, which creates a great threat to the existing forms, but the populations are restored in Erge and Tkhilnari. It is important to take care of the growth of the sea buckthorn in natural conditions, it is necessary to move it to another habitat. The Sea buckthorn grows in stony and groundless soils and there are a lot of such soils in Georgia, which can be restored by establishing specialized farms.

P6. Beridze D.

Growth and Development Peculiarities of Adjara and Adjara-Lazeti Endemic Flora containing Biologically Active Substances

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Our research objects are over 24 endemic plant species of Adjara and Adjara-Lazeti regions. We were the first to find out the species containing biologically active substances among these plants. The research results are published.

In parallel with the experiment, we study the peculiarities of growth and development of productive species in nature and their correlation with the climate.

Biomorphological research of Adjara and Adjara-Lazeti endemic flora was carried out with the help of "Biomorphological analysis of adventive flora of Adjara".

The research objects were the following species containing Nitrogen compounds, Flavonoids and Coumarins identified by us: *Erysimum contractum* Somm. et Levier., *Seseli foliosum* (Somm. et Lev.) Mand., *Astragalus sommieri* Freyn., *Quercuspetra* var. *dshorochensis* c. Koch., *Rubus adzharicus* Sanadze, *Rhynchospora caucasica* Vahl., *Amaracus rotundifolius* (Boiss.) Briq., *Rhododendron smirnovii* Trautv., *Rhododendron ungerii* Trautv., *Centaurea adzharica* Sosn., *Astragalus adzharicus* M.Pop., *Scutellaria pontica* C. Koch., *Astragalus adzharicus* M.Pop., *Linaria adzharica* Kem.-Nath.(= *L. syspirensis* C. Koch.).

It must be mentioned, that the most part of the species suffer from strong anthropogenic factors. Some of them are endangered. Therefore, it is important to study them timely in terms of their conservation and preservation.

According to vital forms, there are three species of trees represented in the spectrum of vital forms of Adjara endemic flora: *Quercuspetra* var. *Dshorochensis*, *Rhododendron smirnovii*, *Rhododendron ungerii* and three types of bushes: *Rubus adzharicus*, *Astragalus sommieri*, *Osmanthus decorus*.

Herbaceous plants dominate in Adjara and Adjara-Lazeti endemic flora.

We carried out phonological investigation of Adjara endemic flora from the second decade of August, 2014 to spring-summer, 2017, including the lowlands and highlands of Adjara littoral. Moreover, we kept observation in subalpine and middle zones of mountains of Adjara.

During the period of intensive growth, we kept observation in decades.

The observations were carried out in direction of studying of growth and development process, from the beginning of plants vegetation period till collecting seeds, according to the basic stages of morphogenesis: plant awakening – beginning of vegetation cycle; coming into leaf; bud proliferation-massive flowering; fruit formation; vegetation deceleration; fruit ripening period; collecting seeds; leaf-falling; the end of vegetation.

We found out that the research plant species of Adjara and Adjara-Lazeti take full cycle of ontogenesis. Their vegetation cycle lasts 9 months from early spring (the end of February) till autumn (October).

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Cytotoxicity Screening of Endemic Plants from Adjara

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In recent years, medicinal plants have become more and more popular in many countries, while in Georgia, especially in Adjara, it always took an important place in healing different diseases. Adjara and the floristic region of Adjara-Lazeti are rich in medicinal plants having a rich history of using these plants in folk medicine. These peculiarities increase motivation of scientific investigation in terms of their chemical and pharmacological evaluation.

Malignant tumors are one of the most common diseases over the world. The mortality statistics due to these diseases is dramatic.

The research purpose of this stage is cytotoxicity screening of endemic plants from Adjara. Research materials were collected in early spring and late summer, 2014-2015, during the active phase of plants growth and development and flowering.

Studying of cytotoxic activities were carried out with the help of Resazurin and Hoechst methods on A-549 (lung carcinoma) and DLD-1 (rectal carcinoma) tumors. Moreover, there was determined their non-toxicity to healthy cells (normal human fibroblast cells WS-1).

As a result of experimental researches, a prosperous plant - *Erysimum contractum* Somm. et Lev. was selected for further investigation.

While applying Resazurin method, the medicine containing steroidal compounds made of *Erysimum contractum* Somm. et Lev. revealed an inhibitory activity to human lung carcinoma cells (A-549) IC - $12 \pm 2 \mu\text{g/ml}$, DLD-1, human colon adenocarcinoma IC - $8.8 \pm 0.5 \mu\text{g/ml}$ and low toxicity to normal human skin fibroblast cells (WS-1)- IC - $56 \pm 13 \mu\text{g/ml}$. Almost the same results were received with Hoechst method, the only difference is that the research object doesn't reveal any toxicity to normal human skin fibroblast cells (WS-1) – IC - $>200 \mu\text{g/ml}$.

Individual steroidal compound so-called E-1 taken from *Erysimum contractum* Somm. et Lev. is characterized by high toxicity.

P8. Botchorishvili A.

Public Health Achievements of the 21st Century

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Introduction and aim

The major public health achievements of the 21st century include improvements in vaccine preventable and infectious diseases, reductions in deaths from certain chronic diseases, declines in death and injuries from motor vehicle crashes according to a report from the Centers for Disease Control and Prevention. The aim of this finding is to show international situation in public health. The advantages and disadvantages and the answer to the question "where are we now?"

Research methodology

Finding is based on statistical analysis methodology. Based on World Health Organization Statistical data and National Statistics office of Georgia.

Outcomes

According to the finding we can say that 43 million lives saved between 2000 and 2014 through effective tuberculosis diagnosis and treatment. 47 % decline in TB mortality rate and 42% decline in TB prevalence rate since 1990. In Georgia the cases of TB is halved between 2008 to 2015.

Bans on tobacco advertising, promotion and sponsorship reduce tobacco consumption. Over 1.3 billion people, or 18% of the world's population, are protected by comprehensive national smoke-free laws. Tobacco users number has declined of 2.8% for the last 8 years.

Road safety laws improve the road user behavior and reduce road traffic crashes, injuries and deaths. Wearing seat-belts can reduce fatal and non-fatal injuries by 45-50%.

Improvements in screening techniques along with strong cancer screening recommendations have led to improve screening rates and a reduction in deaths of 2–3 % per year from colorectal, breast and cervical cancer. In Georgia, screening techniques are in 30 cities.

Conclusion

One of the major findings in the report is that the world has saved billions of dollars in healthcare costs as a result of these achievements. We must not forget Sustainable Development Goals. The third is Ensure Healthy Lives and Promote Well-being for all at all ages. We have goals for 2030. It is the country's obligation as well. We should all do our best and make the world a better place.

P9. Bozhadze A¹., Berashvili D¹., Vachnadze V².

Qualitative Analysis of Liposomal Solution of Chelidonium majus L. total Alkaloids by GC/MS

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Introduction: The nanotechnology has been extensively explored during the last decades and represents one of the most important directions in the technological developments of the leading countries. Liposomes or phospholipid-based particles can be considered one of the most popular nanocarriers for delivering various biologically active substances with the purpose to improve therapeutic efficacy, physical, chemical properties of pharmacologically active substance. Liposomal formulations are the newer research approaches through which detection and treatment of cancerous cells can be achieved, which is penetrating the various biological barriers of human body to identify the cancer cells. Liposomes as pharmaceutical drug carriers were developed to increase antitumour efficacy and decrease drug toxicity. Liposomes are used as good delivery vehicles for plant extract. The incorporation of herbal extract into liposome reduces the side effects as toxicity, low permeability, insolubility and etc. Thus, nanodrug delivery systems have a leading role to play in nanomedicine in near future.

Chelidonium majus L. (family Papaveraceae) has a long history as being useful for the treatment of many diseases worldwide. It is a medicinal plant well-known for the spasmolytic, anti-inflammatory, antimicrobial and antitumor effects of its isoquinoline alkaloids. By the authors of presented abstract has been chemically and biologically studied *Chelidonium majus* L. growing in Georgia, and in biological assay was determined cytotoxic activity of total and individual isoquinoline alkaloids (chelidonine, protopine, stylophine). But the alkaloids are characterized with low biopermeability, high toxicity. Therefore by the authors was prepared liposomal solution of *Chelidonium majus* L. total alkaloids (LSCA) by modified shaking method.

The aim of this study was quantitative analysis of major individual alkaloids entrapped in LSCA.

Material. The object of investigation was LSCA prepared by modified shaking method.

Method. Object for GC/MS was prepared by following way: BSTFA/EtOAc (40:10) was added to liophilised LSCA, solution was heated on 70°C during 20 min. GC/MS analysis was performed on a gas chromatograph Perkin Elmer Clarus 600 GC/MS using column Elit-5MS, 30 m × 0.25 µm, coated with a 0.25 µm film; The carrier gas was helium, flow rate 1.0 mL/min, injection volume 1 µL, transfer line temperature was set at 300°C, injector temperature - 250°C and the temperature progress was as follow: the initial temperature was 60°C for 1 min; it was raised from 60°C to 220°C with an increase of 15°C/min for 2 min; then it was raised from 220°C to 300°C with an increase of 20°C/min for 2 min; Acquisition was made in TIC mode.

Results. The individual components separated by gas chromatography were identified by comparing their MS with the database of spectrum of known components stored in the GC-MS library - NIST 2010 (National Institute of Standard and Technology). Examination of liposomal solution of LSCA by GC-MS revealed the presence of individual alkaloids of

Chelidonium majus L.: protopine, allocryptopine, stylophine, chelidonine. Also there are found other products, which are phospholipid components (myo-inositol-, alonic acid-, turanose, galactopyranoside-, melibiose-, lyxose derivatives).

Conclusion. Qualitative analysis of LSCA revealed presence of targeted alkaloids and additionally isoquinoline group alkaloid allocryptopine, which is characterized with anticancer – cytotoxic activity. Based on results the solution is being recommended for further study with purpose to use for treatment in cancer therapy.

P10. Bolotashvili I., Bakuridze L.A., Chincharadze D.G, Lagazidze D.

Prescription and Technology of Valeological Tablets Made of Flaxseed Mucus

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Flax is a very old plant. It has been known in Georgia since the Bronze Age. According to N. Vavilov's findings, Colchi Kingdom used to be the center of flax production.

Till today, flax mucus is produced in-house with boiling the flaxseed. The product is perishable, raw materials are not used in a reasonable way and the most parts of its biologically active substances are dumped. In order to get a therapeutic effect, one need to get it several (3-7) times a day and due to this, it is inconvenient. Moreover, it is characterized by unpleasant organoleptic qualities (smell, taste).

Thus, developing reasonable and efficient technologies for getting flaxseed mucus as well as producing dosed solid tablets containing the mentioned mucus is a logical solution for this problem. It will lead to extend the expiry date of a readymade product, improve its organoleptic qualities and make it convenient for receiving.

Developing prescription and technology of valeological tablets made of flaxseed mucus.

We extracted flaxseed mucus considering some literature data, in particular, extractant - water, correlation of raw materials and the extractant - 1:30, extraction time- 30 m, which is identical to the literature data.

Effects of drying methods on technological features of dry flaxseed mucus are studied. It was found out that condensation and drying of flaxseed mucus on high temperature (90-70°C) have bad impact on dry mucus solubility. Freeze-drying is considered to be the optimal method for drying.

On the basis of biopharmaceutical researches, extra substances are selected and the prescription for dry flaxseed mucus determined: dry flaxseed mucus (freeze-dry) 0.3 g, croscarmellose (superdisintegrant) 0.08 g, Calcium stearate 0.01 g.

We also studied moisture-containing and pressing effects of tablets to technological features of dry flaxseed mucus tablets. Its optimal moisture-containing is 3% and pressing maximum 120MPa.

The technology for producing tablets of dry flaxseed mucus with the help of granulation is already developed and a technological scheme designed.

P11. Chaidze F.

Ex-Situ Conservation Of Medicinal Species Of Magnolia Genus Introduced To The Batumi Botanical Garden

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Botanical gardens serve the global strategy for conservation of the plants. Our aim is to develop targeted introduction of the plants, ex situ conservation of newly introduced species, study of bio-ecological characteristics, identifying perspective itroducent sand defining their application ways under the conditions of Adjara Black seaside, which was created basis at the edge of XIX-XX centuries. Batumi Botanical Garden and its century-long history of existence serves as an excellent example for this.

For studying morphological and rhythmic peculiarities of the plants, the methods by I. Serebriakov and I. Beidermann, as well as phenological observations were conducted by applying the method acceptable for the Botanical Gardens.

The problem is of actual importance, as the directions and approaches for application of introduced species has not been studied from this viewpoint. For successful introduction it is necessary to pay attention to the issue of usefulness of the species to be introduced and to forecast their introduction.

Plants serve as a continuous source for energy source of biologically active substances, whereas their study and application – serves as a genuine treasure for pharmaceutic chemical science and chemical-pharmaceutic industry.

On the basis of conducted introductive research, while studying morphological peculiarities of separate species, during vegetation period a particular focus was attached to the peculiarities of seasonal growth and development, reproduction issues, terms of separate pheno-phases, relaxation period, winter durability and sustainability towards parasite diseases.

Four medical species of Magnolia family conserved as the result of introductory activity at Batumi Botanical Garden are represented in the article: *Magnolia officinalis* Rehd. et Wils., *Magnolia grandiflora* L., *Magnolia glauca* L., *Magnolia denudata* Desr. *The species studied by us can be given honorable place in the modern medicine and pharmacy in view of application. Complex researches, defining the level of adaptation in Adjara coastline and under introduction conditions upon biological peculiarities of perspective plants it showed that* Batumi Botanical Garden is a real base for genetic resources of the medical plants. By applying this foundation, on the basis of forming large introduced populations it is possible

to ensure rational exploitation of the above-mentioned species in the form of medical raw material.

P12. Chelidze T.R.¹, Enekidze L.G.¹, Gorgaslidze N.S.², Kikalishvili B.I.²

Quantitative Analysis of some Heavy Metals in Flax Seeds and its Oil Growing in Georgia

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One of the most healthful additions to heart healthy diet is ground flaxseeds. This wondrous little seed has played an important part of human history for over 5,000 years. A new study from the Canadian Center for Agri-Food Research shows important effect in promoting cardiovascular health [1]. The major health benefit of flaxseeds has focused on their rich content of oil. The uniqueness of flaxseed oil is a very high content of polyunsaturated fatty acids such as alpha-linolenic acid, both omega-3 and omega-6 fatty acids, which are an essential fatty acids are needed for human health. The Structure of flax Seeds of the Canadian grades, dominating in world production of a flax on nonvolatile solid are following: fatty ingredient – 41%, proteins – 21%, cellulose – 28%. Heavy metals in flaxseed and its oil are approximately: lead - 0,25 mg/kg, cadmium - 0,25 mg/kg, zinc – 50 mg/kg and copper – 10 mg/kg.

The aim of our research is investigation of the heavy metals (Pb, Cd, Zn and Cu) content in the flaxseed and its oil growing in Georgia. Heavy metal contamination of food is one of the most important aspects of food quality assurance. Heavy metals are not biodegradable and persistent environmental contaminants, which may be deposited on the surfaces and then absorbed into the tissues of plants. Monitoring and assessment of heavy metals concentrations in the plats have been carried out in some developed and developing countries. Zinc and copper are essential trace elements till definite concentration and also play an important role in various cell processes including normal growth and development. Lead and cadmium are non-essential trace elements having functions neither in human body nor in plants. They induce various toxic effects in humans at low doses. Our investigation is carried out by the samples from Shiraki plane on the Iori Plateau in Georgia, an interfluve between the river of the Iori in the south and the Alazani in the north. The Shiraki plan is a flat lowland area at the elevation approximately 600 meters above sea level. The climate in the area is moderate continental, with the average annual temperature of

10°C. Samples for investigation were provided by the Institute of Pharmacochimistry, following preparation and processing were carried out according to our previously developed method [1]. Heavy metals (Cu, Pb, Cd and Zn) in the flaxseeds and its oil were determined by differential-pulse polarographic method using PU-1 polarograph. Polarographical process was performed in the three-electrode thermostatic cell (t=25°C) by dropping mercury electrode (t = 3.5 sec, m = 2.6 mg/sec). The potential values were determined referring to the saturated calomel electrode. In the experiments the following substances were used: purified distilled water, hydrochloric and nitric acids and the standard solutions of lead, cadmium, copper and zinc salts. The experiments have shown that the content of copper and zinc in the flaxseed is 4.5 mg/kg and 46.8 mg/kg, which is good coinciding with the literature data. The same composition of lead and cadmium in flaxseed it is significantly increased and equals to 1.25 mg/kg and 2.0 mg/kg respectively. As concerns the linen oil, it contains heavy metals: Cu - 0.32 mg/kg, Pb - 0.043 mg/kg, Cd - 0. Zn - 5.1 mg/kg, that is in good order with the information spread in literature [1,2]. Therefore, on the basis of our investigation we can say that the increased amount of lead and cadmium in the flaxseed it is possible caused by flax properties as the soil cleaning. During the getting of linen oil, these metals remain in the precipitate and the oil fraction is subordinate to the norms.

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P13. Ebraldidze L. Z.

Biopolymer-based Nanoparticles as Carrier of Vincristine for Targeted Drug Delivery

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Cancer is one of the leading causes of death worldwide. Millions of people die from cancer in the world every year. There is no doubt that cancer is a disaster, which touches every community worldwide, without exception. The rise of cancer is the major provoke for modern scientists.

Current cancer therapy strategies are based on surgery, radiotherapy and chemotherapy. Pharmaceutical dosage forms play important role in cancer treatment and increasing quality of life for cancer patients. However, toxicity and side effects are the main problems of anti-cancer drugs.

Therefore, development of present anti-cancer drugs is one of the actual issues for researchers. Particularly, in order to increase efficiency of anti-cancer drugs and reduce their side effects, scientists work on development of nanomedicine using nanotechnology and natural excipients. Achievements in nanotechnology have completely changed the role of excipients in drug formulation giving them new functions. That's why searching new, mainly natural origin excipients for improving drug bioavailability is really important.

Regarding to cancer, the fact should be mentioned - high molecule carbohydrates, exactly glucose is the main source of energy for dividing abnormal cells. There is theory that by target metabolism of glucose it is possible to develop selective mechanism against cancer. According to the above mentioned reasons the purpose of the work was to prepare biopolymer-based nanoparticles as the carriers of vincristine.

Based on biopharmaceutical research natural high molecule carbohydrates (seaweed, flax seed-based polysaccharides, citrus pectin), as matrix transporters were selected. Different amount of Polysorbat 80, Polysorbat 60, sodium dodecyl sulfate, glycerol were used in compositions as an emulsifying agent and as a stabilizer. Also correlation between API and natural high molecule carbohydrate was determined.

High-energy emulsification method was used for preparation of anti-cancer plant alkaloids containing targeted delivery nanosystems. For the next stage of research prepared nanosystems were characterized. Physicochemical characterization of nanoparticles: their size, shape, distribution was performed using modern instrumental equipment: AFM (atomic force microscope) and SEM (scanning electron microscope).

The present study explored the possibility of production of NPs using natural (herbal origin) polysaccharides. There were prepared 6 compositions. Optimal correlation between API: polymer was determined to be 1:10. The nanoparticles were generally spherical in shape. The average range of nanoparticles was 100 to 250 nm as visualized by SEM. The best stabilizer properties was obtained by combination of SDS and Polysorbat 80, rather than separately.

In this review, we have discussed the preparation of NPs using natural high molecule carbohydrates (seaweed, flax seed-based polysaccharides, citrus pectin). These materials

have the capacity to hold drug molecules and deliver drugs directly to cancer cells at a sustained and controlled rate.

P14. Gaprindashvili A.

Clays from Adjara Region, their Physical Features and Chemical composition.

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Georgia is full of useful endemic resources, which are not only untapped but also not studied. Their reveal, study and develop using methods is one of the most important issues as in Modern Medicine also in Cosmetology. No one from the Earth's resources has such a broad, important and versatile use as clays. They are widely used in medicine and cosmetology – as a natural as well processed form, they are used: in Balneology and Resorts Therapy, for treatment of bone-joint and rheumatic disease, various types of skin diseases, besides it's very interesting to use them as an auxiliary means and a base in various soft and solid medicinal forms.

Adjara is one of the most interesting regions of the clay resources. Here a local population and many tourists use clays arbitrarily, despite the fact that their chemical composition and medical properties have not been studied and it is only on the traditional medicine level. In the literature available to us, we have not found the data about the clays widespread in Adjara Region. That is why the most actual problem in medicine and pharmacy is to research the clays widespread in Adjara for further usage in medicine and cosmetology.

At this stage of the study, our purpose was to research physical features and a chemical composition of biologically active substances in the clays spread in Adjara. In particular, we determined the fractial content and particle size of samples, density, humidity, fluidity, petrographic studies and X-ray diffraction, also existence of amino and fatty acides.

Consequently, from studying physical features we determined that mostly fractial content of our samples are from 0.5 to 1.0 mm. particle size. Humidity was 15%, according to density and fluidity our samples belong to middle heaviness $1100 > \rho > 600 \text{ kg/m}^3$ and high friable powders. X-ray diffraction and petrographic studies were conducted on the base of Mining Geology Faculty of Georgian Technical University. There was used the polarization microscope Amscope PZ300T-5M and DRON-3. There was discovered significant quantity of minerals. Determination of existence amino and fatty acids has been undertaken on the base of Tbilisi State Medical University; the method was chromatography on the thin layer (TLC). Based on the research there were not discovered amino and fatty acids in the clay samples.

To conduct the mentioned researches will allow us to develop the nature - healing and cosmetic remedies of accessible and cheap price. For social-economical point of view, our

research will contribute not only to health care, but also in medical and economic tourism of our country. In particular, for popularization and development of the mentioned region - manufacturing, employment, services, procedures, realization and so on. As for scientific point of view, there will be created the new form of pharmaco- therapeutic means, which will develop the new technologies and approaches in the field of using the healing clays.

P15. Getia M., Mchedlidze K., Churadze M., Lomidze E., Aneli J.

Anatomical and Morphological Characteristics of the Bark of the Georgian Local Endemic Species *Betula megrelica* L.

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In Georgian flora Genus *Betula* L. (*Betulaceae*) is presented by the 5 members. *Betula megrelica* Sosn among them is a local, endemic plant of Georgia [1]. *Betula megrelica* is very important species of the forests of subalpine line and grows on the lime grounds of west Georgia (Mingrelia). The species of Gen. *Betula* L. contain triterpene and phenolic compounds. On the basis of experimental researches more than 20 individual biological active compounds from the bark of the *B. megrelica* are isolated [2].

The Genus *Betula* L. is polymorphic, the morphological and structural researches of the plant create evidence based on the determination of the status of the species and makes clear the many critical issues systematization of the Genus.

The diagnostic characteristics of the cortex of the stem of *B. megrelica* belong: Scattered protective tissue and structural units of the active periderm; the primary cortex parenchyma is separated from the components of the secondary cortex; in the bark of the stem exists the hollowed phloem fibers and the tangentially lied, isodiametric sclereides.

On early stages of the stem differentiation are fixed phloem fibers and then are dominating the stony cells. In parenchyma of cortex and phloem there are exist druze crystals of oxalic acid, also is possible to find rhombus shaped crystals.

Cells of protective tissue of stem, cork and cortex parenchyma usually have dark-red color; the similar color have sclereides and radial rays cut from the central cylinder.

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P16. Gogitidze N., Mushkiashvili N., Moistsrafishvili M., Mulkijanyan K.

Comparative Hepatoprotective Activity of some Essential Oils

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Hepatic damages are mainly due to toxins in the food, pharmaceuticals like CNS active agents and antibiotics, hepatotoxic chemicals like alcohol and certain environmental pollutants. When compared to modern medications for treating liver diseases like immunosuppressive agents and corticosteroids, natural remedies are claimed to grant better relief in a longer run. Amongst them essential oils (EO) - complex mixtures of compounds extracted from different plants hold a special place. For ages, EOs have been widely used and are still in use in many parts of the world.

The aim of this study was to compare the hepatoprotective effect of three EOs from pumpkin (*Cucurbitae maxima* Duch.) seeds in rodent model of induced liver toxicity. EOs were obtained by cold (EOCS-I) or hexane (EOCS-II) extraction and compared with commercially available oil (EOCS-III). The hepatoprotective action was evaluated by the duration of sleep caused by sodium pentobarbital (Nembutal) on the background of severe or moderate decreased activity of liver enzymes caused by intraperitoneal and subcutaneous administration of carbon tetrachloride (CCl₄), correspondingly [1].

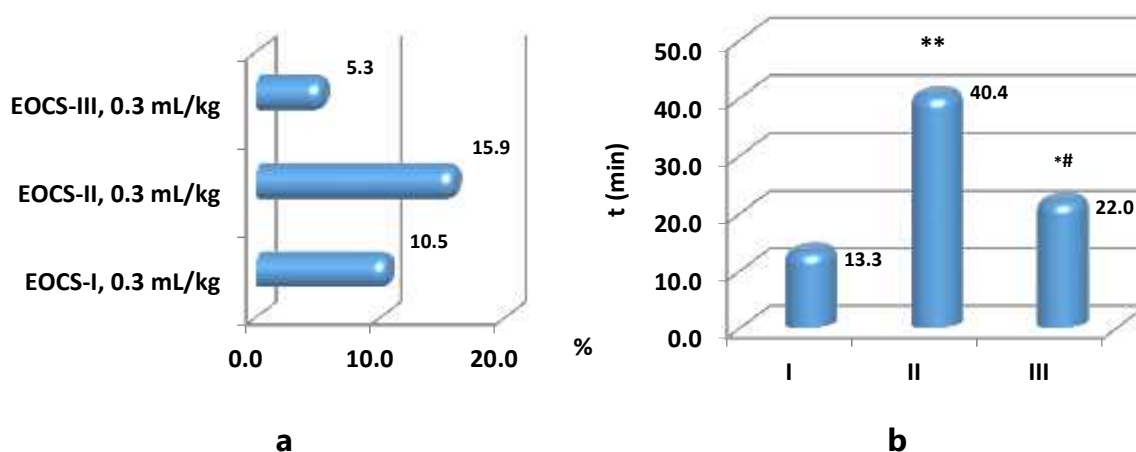


Fig. 1. Hepatoprotective effect of EOCSs.

a) severe damage model: x-axis – shortening of Nembutal sleep duration (%) vs basic control (CCl₄ + nembutal 40 mg/kg);

b) moderate damage model: Nembutal sleep duration: I - untreated control (nembutal 40 mg/kg); II - basic control (CCl₄ + nembutal 40 mg/kg); III - CCl₄+EOCS-II(0.3 ml/kg).

* - p<0.05 ; ** - p<0.01vs untreated control; # - p<0.01 vs basic control

The obtained results reveal that all EOCS had minor hepatoprotective effect in case of severe hepatic damage caused by i.p. injection of CCl₄. On the other hand, EOCS-II, which appeared relatively active in above mentioned assay, exhibited pronounced activity in the model of moderate hepatic damage. Both EOCS-I and EOCS-II were superior to the commercial EOCS-III. Thus, the EOCS-II may be beneficial in the prophylaxis of damages associated with the decreased activity of P450 enzymes responsible for hepatic Phase I metabolic processes [2].

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P17. Gokadze S., Barbakadze V., Mulkijanyan K.

Wound healing gels on the basis of plant biopolymer

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Treatment of wounds and burns is considered as an important problem. Despite the ethiopathology such injuries are complicated with pain syndrome, pathogenic microflora, purulent exudate, abundant hydration, etc. Therefore the development of medicinal forms for external application with complex effects on skin wounds, burns and inflammatory factors is still a challenge for pharmacists. Various formulations available on the market can be divided into different categories depending on their function, material and the physical form (powder, foams, gels and hydrofibers). Amongst them gels, hold a special place due to their ability to treat heavily exuding wounds. The centuries-old practice of using phytopreparations (aka herbal remedies) proved that they usually have fewer side effects in comparison with synthetic drugs, but despite the wide application of herbal preparations, information about their application in development of wound and burn healing modern dosage forms lacks. Recently a phenolic polymer poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDGA), containing approximately 25% of polysaccharides and 1.5-2.5% of dry plant material, was isolated from the roots and stems of Caucasian comfrey species (*Symphytum asperum*, *S. caucasicum*) and its high immunomodulatory (anticomplement), antioxidative, antilipoperoxidant, anti-inflammatory and wound-healing efficacy was established. The aim of the present study was the development of the composition and technology for the PDGA-containing gel. 15 model dosage forms were prepared using various (hydrophilic, lipophilic and hydrophilo-lipophilic) gel-forming bases and evaluated using state-of-the-art physical, physico-chemical, technological, biopharmaceutical, microbiological and pharmacological methods.

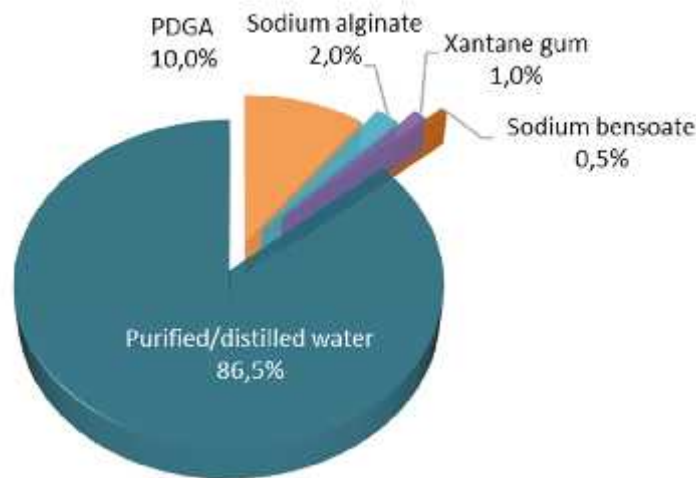


Fig. 1. PDGA gel composition

According to the results of complex biopharmaceutical studies PDGA gel optimal composition has been established (Fig.1) and corresponding technological scheme for PDGA containing gel preparation has been developed. PDGA gel stability under normal conditions of storage at 40°C was studied. Shelf life of the gel is 2 years.

P18. Golijashvili R., Golijashvili A., Murtazashvili M., Gholadze S., Papukashvili I.

Bacteriophage technology as the viable and effective alternative to antibiotics and its significance in combating antibiotic resistant bacteria

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Introduction and research purposes: The threat of infectious diseases of bacterial etiology remains high not only in developing countries, but in the whole world. Pathogenic bacteria are common causes of serious problems in healthcare, veterinary, agriculture and food safety. In modern medicine, antibiotics are the most common medications used against bacterial infections. However, antibiotic use is usually accompanied with adversities, such as allergic reactions, toxicity, intestinal disorders, immunosuppression, etc. At the same time, wide-scale use of antibiotics has caused the emergence and spreading of antibiotic-resistant bacterial strains. Antibiotic resistance is recognized as one of the biggest global threats by the World Health Organization (WHO). Based on recent statistical data, it is forecasted that if the antibacterial resistance problem continues to grow at the given pace, it will be causing 10 million annual deaths by 2050. Discovery of new antibacterial agents, development of new methods of treatment and their introduction to medical practice has become paramount for global healthcare.

Nowadays, bacteriophages are considered one of the most effective alternatives to combat bacterial infections. One hundred years of bacteriophage research has revealed a number of important factors that define their advantages over antibiotics and other antibacterial preparations. Bacteriophages are bacteria's natural adversaries, having the ability of rapid self-replication, lysis of antibiotic-resistant bacteria, adaptation and suppressing the development of phage-resistant strains. Bacteriophage reproduction occurs only in the presence of phage-sensitive bacteria, after the lysis of the last microbial cell, bacteriophages leave the organism. Phage preparations are safe, do not cause any side effects and complications; Phages specifically target their host bacteria; they do not cause dysbiotic changes, do not have cytotoxic action and do not have influence on metabolism. It is remarkable that the development of a new phage medication is distinguished from antibiotics by relatively low costs and short terms. Production of phage preparations is an eco-friendly process.

Our research purposes have been to demonstrate the safety, high therapeutic potential and efficacy of phage preparations for treatment and prevention of bacterial infections through scientific and clinical studies of JSC Biochimpharm's bacteriophage preparations.

Research methodology: Scientific study of JSC Biochimpharm's bacteriophage preparations, manufactured by state of the art technology - Septaphage, Phagyo, Phagestaph, Phagepy - were performed in accordance with the standards of the International Committee on Taxonomy of Viruses.

In vitro control of preparations – the spectrum of phage lytic activity was determined against homological bacterial strains (159 strains) from international collections and various countries (Spain, Germany, Austria, USA), and against 231 homological bacterial cultures of Biochimpharm's own collection.

Placebo-controlled clinical - *in vivo* - studies of phage preparations were performed together with physicians.

Results: The *in vitro* control of JSC Biochimpharm's therapeutic bacteriophage preparations - Septaphage, Phagyo, Phagestaph, Phagepy - against homological bacterial strains from international collections and various countries (Spain, Germany, Austria, USA) has revealed a high therapeutic potential (75-98%) that corresponds to the standards (65-100%). And the spectrum of phage lytic activity against homological bacterial cultures of Biochimpharm's own collection is up to 100%.

Clinical - *in vivo* - studies (Infectious Diseases, AIDS and Clinical Immunology Research Center, Tbilisi; Children's City Clinical Hospital of Infectious Diseases, Almaty; City Children's Clinical Hospital, Almaty; G. Zhvania Pediatric Clinic, Tbilisi; Osh interregional clinical hospital) performed on JSC Biochimpharm's phage preparations (Septaphage (liquid, tablets), Phagyo, Phagestaph) have shown their safety and therapeutic effectiveness for treatment of intestinal, purulent-surgical and respiratory infections.

Conclusion: Basing on research results (in addition to a hundred years of empirical data) the use of bacteriophages can be highly recommended in healthcare, as well as agriculture, veterinary and environmental safety. Bacteriophage preparations are natural, safe and effective solution to the problems caused by resistant bacterial strains.

P19. Gorgaslidze N., Nizharadze N., Nadirashvili L., Erkomaishvili G.

Selection of bases for enzyme containing gels

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For a significant time now, enzymes have been used as potent medication for the treatment of a variety of maladies. Proteolytic enzymes have been studied in our institute for over 40 years. As a result, a medication called Caripazym was developed from papain. Besides papain, bromelain, an enzyme found in pineapple (*Ananas comosus* L. Merr.), has become the subject of our research. Our interest for this enzyme has greatly increased when it was determined that apart from properties similar to papain; bromelain possesses antitrombotic and anti-carcinogenic effects as well. Several physical-chemical properties of stem and fruit bromelain were studied. These include: the effect of cysteine and casein on hydrolysis speed, dependence of casein lysis speed on bromelain concentration. The effects of temperature and pH on bromelain activity were also determined. The optimal temperature and pH values were established.

Recently we have been working on the development of a Caripazym gel for electrophoresis, which will be used to treat bone and cartilage diseases. Since the preclinical studies were promising, our goal was to develop a similar gel based on bromelain, which will be used to treat thrombosis and atypical neoplasias.

Bromelain's proteases are proteins characterized with low stability, easily deactivated with storage; which is perhaps at least in part due to autolysis. Thus for the development of a gel, bases must be used that significantly increase the stability of bromelain's proteases in aqueous solutions. We propose glycerol as the most suitable base for such a gel, since it inhibits autolysis and at the same time allows a variety of gel consistencies. Different versions of hydrophilic bases were studied: mixture of glycerol with methylcellulose of various molecular masses; mixture of glycerol with polyethylenglycol of various molecular masses. The substances chosen for the preparation of the gel provide for optimal absorption and stability of the active ingredient (tab.1)

Table 1.

Gel	Proteolytic activity/g gel					
	0	90 days	120 days	150 days	240 days	360 days
GelMC-bromelain	257,3	209,4	198,5	142,4	126,7	116,6
GelPEO-bromelainI	347,4	338,4	329,5	308,6	299,3	295,6
Gel PEO-bromelainII	321,6	316,5	311,1	305,9	295,3	291,7

Based on the obtained data it was determined that a stem bromelain gel prepared on the base of polyethylenglycole retained 85-90% of its proteolytic activity for 12 month. While that of the gels prepared based on methylcellulose decreased to 45-50% within 12 month.

P20. Gorgiladze T. ¹, B.G. Partskhaladze¹, I. Nozadze,²

Pain Modulation by Interaction of Opioids and Several Neurotransmitters in the pain matrix structures

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Aim of Investigation: Pain is a unified experience composed of interacting discriminative, affective-motivational, and cognitive components, each of which is mediated and modulated through forebrain mechanisms acting at spinal, brainstem, and cerebral levels. Descending pain inhibitory pathways plays a critical role in determining the experience of both acute and chronic pain and has a different neurochemistry and different neuroanatomical connections. Structures involved in the descending analgesia systems, including the the midline periaqueductal gray-rostral ventromedial medulla (PAG-RVM) system, amygdala and cerebral cortex. The rostral ventromedial medulla (RVM), comprising the nucleus raphe magnus (NRM) and the adjacent reticular formation is a critical link in a descending nociceptive modulatory network, with a major input from the PAG, and projections to dorsal horn regions implicated in nociception. The maingoyal of the present study was to investigate interaction opioids and several neurotransmittersof some pain-matrix structures of the brain

(CeAand PAG, RVM) that are involved in processing and modulation of painful signals.

Methods: The experiments were carried out on experimental and control (with saline) white male rats. The antinociceptive effect was measured by tail-flick (TF) and hot plate

(HP) tests. For drug administrations, stainless steel a guide cannula were implanted in the CeA, PAG, and RVM. The opioidergic, serotonergic and cholinergic receptor agonists administration in one structure and antagonists or agonists in another structure were used. Guidelines of International Association for the study of Pain regarding investigations of experimental pain in conscious animal will be followed throughout. The analysis of variance (ANOVA) with post-hoc Tukey-Kramer multiple comparison tests were used for statistical evaluation.

Results: The results of these experiments indicate that the antinociceptive effect of microinjection of morphine in the CeA can be reduced by prior preinjection of naloxon in the PAG; As well as administration of morphine in the PAG can be eliminated by prior preinjection of methysergide/atropine/naloxon in the RVM when TF was used to measure nociception. Simultaneous administration of subthreshold doses of opioid agonists in to PAG and serotonergic agonists in the RVM evokes increased of antinociceptive effect.

Conclusions: Above mentioned facts indicate, that endogenous antinociceptive system should regulate painful afferentation supraspinal levels by means of several different neurochemical mechanisms and substrates. Our data establish that functional relationships exist between some pain-matrix structures of the brain (CeA and PAG, RVM) and mediating opioid antinociception.

P21. Gurgenidze I. A., Japaridze Sh. S., Chelidze T. R., Tatishvili G.

Adsorption of benzene carboxylic acids at the mercury from aqueous and ethanol solutions.

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Benzene carboxylic acids are applied in medicine and pharmacology at synthesis of the medicines containing blood, in orthopedics and stomatology during creation of bio-elements and composite materials. Acids are characterized by anti-carcinogenic activity therefore their studying has not only scientific but also the practically important. It is well known that the absorption ability of substances help to penetration of them in the living organism.

The adsorption of benzene carboxylic acids [mellitic acid (benzene-1,2,3,4,5,6-hexacarboxylic acid, trimellitic acid (benzene-1,2,4-tricarboxylic acid), trimesic acid (benzene-1,3,5-tricarboxylic acid), pyromellitic acid (benzene-1,2,4,5-tetracarboxylic acid) from aqueous and ethanol solutions was studied of a stationary Hg electrode by measuring the differential capacity (C) as a function of the electrode potential (E) by means of an a.c.

bridge at 400 Hz. The solutions temperature was kept at 20° C by means of water thermostat. Potentials were measured against to saturated calomel electrode. Analysis of the experimental data in terms of the Frumkin-Damaskin theory shows that the adsorption of these acids conform well to the Frumkin isotherm with particle-particle interaction corresponding to attraction. It was indicated that at the anodic polarization adsorption was caused by the strong p-electron interaction of the aromatic ring with the electrode surface.

The difference in the adsorptive ability of these acids in the ethanol and aqueous solutions has to be caused by various orientation of these solutions to an electrode surface. According to literary data (2) in the both solvent are in a type of big sizes acids anions and also there are some quantities of non-diagnosed molecules in solution. It is possible to assume some simultaneous effects: effect of squeezing of neutral molecules of adsorbate on electrode surface from solution, effect of π -electronic interaction on the positively charged surface of an electrode, effect of electrostatic interaction of carboxyl group to surface. Lower value of a depression of capacity in ethanol solutions than in aqueous solutions are explaining by the most part of that component in the size of adsorption which corresponds to orientation of carboxyl group in ethanol solutions to the electrode surface. At this time should happen the increases in that component which corresponds to an electrostatic attraction of negatively charged atom of oxygen of carboxyl groups of acids with positively charged electrode surface. This reduces the thickness of the adsorption layer, which leads to increased capacity.

Following the adsorptive parameters are calculated from Frumkin-Damaskin's theory: the minimum value of capacity (C^1), concentration corresponding to a half of degree of fullness ($c=\theta=0,5$), a constant of interaction of the adsorbed molecules (a), the adsorptive constant released at adsorption standard energy ($(-\Delta G_A)$). Released standard energy at adsorption of benzene carboxylic acids it is less value in water solutions, than in the ethanol solutions that indicates big adsorptive ability of benzene carboxylic acids in the ethanol solutions in comparison with aqueous solutions.

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P22. Gvinjilia S.A., Tsintsadze T.G., Iavich P.A., Mishelashvili Kh.T., Shashiashvili N.V.

To the problem of the creation of cosmetic and cosmetological preparations for the prevention and treatment of skin diseases.

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Currently due to natural factors and disruption in the nutrition order, there are quite significant changes in the structure of skin. According to statistical indicators, the number of patients with so-called normal status of skin is decreasing and the number of patients with not only dry and oily skins is increasing, but there is such a problem as increasing the number of people with problem-prone skin and its premature aging. Deteriorating environmental conditions, changing climatic conditions in Georgia - increasing the level of solar radiation, also has an effect, worsening the structure of skin. Recently, there has been an increase in acne diseases of various etiologies, mainly microbial, pyoderma, and so on. Therefore, the issues of prevention of skin changes and, if necessary, its treatment are one of the main tasks of current cosmetics and cosmetology.

The methodology of treatment and prevention should include elements of permanent skin care with the help of ointments and creams that not only provide it with a certain set of nutrients and drying substances, but also preparations for preventing the effects of solar radiation, protection from dust and harmful automobile and industrial emissions. The methodology for creating and treating such means should be based on the requirements of ISO and other existing normative documents.

In the presented study, vegetable oils are used that provide a nourishing effect in the treatment of skin, as well as antimycotic and wound healing effect. Combination of oils with a number of substances can dramatically enhance the above properties. It should be noted that a number of such oils can play the role of filters that allow cutting out the spectrum of the most active and harmful solar radiation. Combination of a number of oils with a certain group of plant origin waxes reliably protects the skin from dust as well as from harmful automobile and industrial emissions. The application of a certain type of liposomes, containing various biologically active substances that have a positive effect on the skin structure, can significantly increase the biological activity of ointments and creams.

Taking into account the fairly rich flora of Georgia, the abundance of plant raw materials, including plants containing a range of substances characteristic only for our region, a significant amount in plants of biologically active substances with certain therapeutic parameters, we can assume that the presence in Georgia of the corresponding cosmetic and cosmetological enterprises will give impetus to the increase of economic potential of country.

P23. Iashvili T., Tavartkiladze T., Mikaia G., Gagua N., Bakuridze L.

Technology and prescription of skin anti-aging emulgel

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Aging- Is the irreversible physiological process, which cannot be avoided and this process is primarily visible on the face, which is discomfort for person, especially for women. Humankind was always interested in investigating the reasons and mechanisms of aging. This is linked to the fact that person is always trying to maintain the youth and health as long as it is possible. The main problem of esthetic medicine is external manifestation of aging, mainly visible aging changes of skin. Aging- is the staging destruction and loss of main functions of organism.

The efficacy of medicinal products to be used on skin and mucous is highly dependent on medicinal form of drug.

Medicinal products such as ointments, creams, and lotions have many negative features; they are characterized by stickiness, which makes discomfort during application. In addition, the spreading coefficient is decreased. For this reason, using gel structure is more frequent in cosmetology and medical field.

The aim of the research was to develop the prescription and technology of emulgel.

The composition of anti-aging emulgel has been developed: % hesperidin 1.0; aloe dry extract 1.0; flavonoid extract of fruits of grapes 0.5; Alpha tocopherol acetate (vitamin E 10%) 3.0; Carbopol 940 1.0; polysaccharides of plantain 0.5; propylenglycol 5.0; tvin 60 0.5; potassium hydroxide 0.8; dimexide 0.6; natrii benzoate 0.015; distilled water 100g.

It has been studied the bioavailability of hesperidin based on gelcreator. It has been outlined that gelcreator has influence on gel availability. The maximum availability of hesperidin is effected from the gel that is prepared based on 1% carbopol.

During rheological characteristics of emulgel it has been demonstrated the inverse proportion dependence of viscosity and disperse speed whenever measured. The rheological characteristics is in optimum ranges.

The characteristics such as: homogeneity, the PH, colloidal stability, thermo stability and viscosity are respected and they meet requirements for soft medicinal forms of state pharmacopeia.

Female volunteers have used emulgel for 1 month and the results were: decrease of oil, cleanness of pores, decrease of keratinocytes and lightness of pigments.

P24. Iavich P.A., Gabelaia M.A., Kakhetelidze M.B., Churadze L.I.

Rheological Study of Some Therapeutic Ointments Developed in the Institute of Pharmacochemistry of the Tbilisi State Medical University

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A number of recipes of prophylactic ointment were developed in the TSMU Kutateladze Institute of Pharmacochemistry. This paper describes three types of recipes with different

components. All ointments contain lipophilic fraction derived from curative mud Akhtala. Recipes of the ointment also include products used in cosmetics.

Developed ointments have cream like consistency that satisfies existing requirements visually, with its organoleptic, colloidal and thermostable properties.

Rheological study of the ointments was carried on viscometer (NDJ-8S Digital Rotary Viscometer). Rheological indicators such as dynamic and plastic viscosity, fluidity, thixotropism, shear deformation, shear velocity, rotational moment and etc. were determined. According to the obtained datagraphs reflecting interdependence of different values were constructed.

The results show ointments' ability to be easily applied to the skin, also property of good retention and absorption, as well as capacity to be easily squeezed out of the tube.

Rheological indicators are given in Table 1.

Table 1. Rheological indicators of developed ointments

name of the indicator	ointment sample		
	1	2	3
dynamic viscosity μ (Pa s)	514.5	180	263.5
fluidity $f = 1/\mu$ (s^{-1})	1.9×10^{-3}	5.6×10^{-3}	3.8×10^{-3}
dynamic density margin (Pa)	173.9	74.3	358.5
plastic viscosity η (Pa s)	27.7	20	38.8
plasticity coefficient ψ (s^{-1})	6.3	3.7	9.2

Based on their physical and chemical properties these ointments can be recommended for treatment of various skin diseases.

P25. Imnadze N.

Liquid Chromatography-Tandem Mass Spectrometric Assay for Duloxetine in Human Plasma

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Duloxetine is a thiophene derivative and a selective neurotransmitter reuptake inhibitor for serotonin, norepinephrine, and to a lesser degree dopamine. It belongs to a class of heterocyclic antidepressants known as serotonin–norepinephrine reuptake inhibitors.

The main uses of duloxetine are in major depressive disorder, generalized anxiety disorder, neuropathic pain, chronic musculoskeletal pain, and fibromyalgia. It is recommended as a first line agent for the treatment of chemotherapy-induced neuropathy by the American Society of Clinical Oncology and as a Grade B recommendation for the treatment of diabetic neuropathy. Although, the French medical journal *Prescrire* concluded that duloxetine is no better than other available agents and has a greater risk of side effects.

It should be emphasized that even during clinical trials duloxetine shown the suicide effect in patients without any history of mental problems.

The aim of current work was to develop the method of analysis of duloxetine determination in biological material for its future implementation in clinical and chemical-toxicological laboratories.

This paper describes a simple, rapid and sensitive liquid chromatography–tandem mass spectrometry assay for the determination of duloxetine in human plasma.

Analyte was extracted from 100 μ L of human plasma samples via solid phase extraction technique using reversed phase octadecyl LC₁₈ cartridges. The chromatographic separation was achieved on a Zorbax Eclipse C₁₈ (100 \times 2.1 mm, 1.8 μ m) column, equipped with pre-column UHPLC GUARD Zorbax Eclipse C₁₈ (5 \times 2.1 mm, 1.8 μ m) by using a mixture 0.1 % formic acid water solution (CHROMASOLV®) and 0.1 % formic acid acetonitrile solution (Thermo Scientific™) (60:40, v/v) as the mobile phase at a flow rate of 0.5 mL/min. A run time -4.0 min, retention time - 0.984 min. Multiple-reaction monitoring mode (MRM) was used for quantification of ion transitions at m/z 298/154. The calibration curve obtained was linear ($r^2 \geq 0.9971$) over the concentration range of 0.5–40.0 ng/mL.

The proposed method was found to be applicable to clinical studies and makes possible to conduct the safe pharmacotherapy and do appropriate rapid, sensitive and selective chemical-toxicological analysis in case of such need. And a run time of 4.0 min for each sample made it possible to analyze more than 100 plasma samples per day.

Study of biologically active substances of the Washington Navel fruit, widespread in the region of Adjara

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Introduction and purpose of the research:

Citrus fruits, including orange Washington Navel, are characterized by the best nutritional, dietary and medical-prophylactic properties. In order to increase citrus crop mineral fertilizers are used. Using mineral fertilizers is associated with environmental pollution, which can be led by invalid selection of agrotechnical actions. At the same time, storage ability of fruit is very low. That is why using organic products as a fertilizer is so important. Such is the "Stimufung" - liquid organic fertilizer for feeding plants not from roots. The "Stimufung" is of organic origin and is represented by amines, amides, oligopeptides, phytohormones, minerals, micro and macro elements. It does not contain heavy metals, nitrates and other xenobiotics and is not dangerous for the environment and people. The purpose of the research is to study biologically active substances of orange Washington Navel, widespread in the region of Adjara, after processing it with Stimufung, liquid organic fertilizer for feeding not from roots.

Methodology:

full-grown trees were sprayed (processed) by Stimufung solution with the concentration of 2.5 ml/l. At first, trees were sprayed while blooming. The other processings were accomplished with intervals of two weeks, one month and two months. Fruits were picked up in period of technical ripeness. Chemical indicators of fetus, such as titration acid, total carbohydrate, Vitamin C were determined in juice. Antioxidant activity, total phenolics and flavonoid glycoside were determined in juice, skin and pulp of the fruits. Laboratory analysis was also conducted after three months of storage. After storage, the number of rotten fruits was counted in the trial and control options. The study of biologically active substances was carried out using a high pressure chromatography method.

Results:

as a result of processing orange Washington navel trees with Stimufung solution titration acidity decreases, amount of total carbohydrate and Vitamin C increases, which forms good taste characteristics of the fetus. At the same time, storage ability of orange fetus has significantly increased. Thus, orange fruits can be used not only for seasonal purposes. There is no significant difference between rates of antioxidant activity in trial and control options. The substantial difference between experimental and controllable varieties of orange fruits in the quantity of common phenolic compounds is not observed until the fetus is stored; after storage in trial option the rate of total phenols in the fetus juice

increased more than in control option. This is probably due to the fact that part of the phenols become soluble in the juice.

Conclusion:

The Washington Navel fruit, which is widespread in the region of Adjara, is characterized with good taste and medical-prophylactic properties; Stimufung is effective for processing trees in order to get healthy fetus.

P27. Kandelaki.M; Metreveli.M

Bioecology of medicinal species of *Rhododendron.L* growing in Batumi Botanical Garden

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Rhododendron.L differs in the world with its diversity and is represented by 1000 species. In the collection of Batumi Botanical Garden there grow v13 species of *Rhododendron.L*. The species of *Rhododendron.L* have long been used in folk medicine in Tibet, China, Japan and Russia. Different types of *Rhododendron.L* are characterized by a rather high content of biologically active substances in the above-ground organs, which give them medicinal value and allow treating such diseases as cardiovascular, rheumatic diseases, vegetative neurosis, epilepsy, chronic colitis and etc. Their medicinal effect is due to biologically active substances- Andromedotoxin, rhododendron, ericoline, arbutin and others.

Rhododendron ungeronii, *Rh. Smirnowii*, *Rh. Ponticum*, *Rh.luteum*, *Rh. Aureum f. roseum* have the greatest content of biologically active medicinal substances among the species existing in Batumi Botanical Garden.

The purpose of our study is to study the bio ecological characteristics and the possibility of reproduction of these species in the soil and climatic conditions of the coastal zone of Adjara. Observations were made using the methods of Beidemann and other popular phonological methods.

***Rhododendron smirnowii* Trautv.** is naturally spread at 900 to 1600 meters above sea level. It is an evergreen shrub. There are about 10 species in the collection of Batumi Botanical garden. Vegetative period begins in the middle of March, its shoot grows in March-August. The annual growth is 1.5-3.8 cm. It is not characterized to grow again. It is sensitive to air and environmental conditions and poorly adapted.

***Rhododendron ungeronii* Trautv.** –common distribution: North-East Anatolia. In Georgia, it naturally grows in the mountain range of Adjara-Shabsheti at 450-1900 m above sea level. It is an evergreen shrub. The vegetation period in the botanical garden begins at the end of May, and the average duration lasts 47 days, the annual growth is 11-13 cm. Flowering begins in late May, but the mass flowering begins in the second half of June. The

average flowering period is 38 days. Seedling ripens in November and December. Germination is heavy. It is not reproduced by cutting.

***Rhododendron luteum* Sweet** is naturally represented in the Western and Eastern Caucasus from the coastline to the Alpine meadows. It is a deciduous brush of 1-2 meters high. The vegetative period starts from the third decade of March, and its average duration is 95-100 days, the average annual growth of shoots is 10-15 cm. Flowering period begins in the first decade of April, and a plentiful flowering period – from the second decade of April and lasts 45 days on average.

***Rhododendron ponticum* L.** Naturally grows in Caucasus. It grows at 2000 m above sea level in Adjara. The vegetation period begins in the first decade of May and lasts 68 days on average. The annual growth is 20-35 cm. It is characterized by cessation of growth and continuation in September and October. Flowering begins in the first decade of April, mass flowering period begins from 25.04; the average flowering period is 48 days. It blooms repeatedly in the warm autumn. It grows roots. It is poorly reproduced by cutting.

Rhododendron arboreum* N. W. Smith f. *roseum – is an evergreen tree naturally spread in Himalayas. There has survived one of the species in the collection of Batumi Botanical garden. The period of its vegetation begins on April 15 and lasts until May 25. The average duration of vegetative period is 38-40 days. Annual growth is 7-9 cm. In recent years, it has not bloomed.

The vegetation of these species is *Rhododendron L.* goes normally under the humid subtropical climate in Adjara, however, the problem lies in their reproduction, what we are working on.

P28. Kankava K.¹, Kvaratskhelia E.¹, Kvaratskhelia T.¹, Burkadze G.², Abzianidze E.¹

Epigenetic changes in retrotransposons and breast cancer – revealing possible associations

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Introduction

Retrotransposons are found to have fluctuating activity during cancer development and progression. Their activity is associated with genomic instability and largely dependent on methylation status of these elements. Long interspersed nuclear element 1 (LINE-1) retrotransposons are the most widely studied among them. In this study, we examined LINE-1 methylation in DNA extracted from breast tumor tissue, adjacent normal breast tissue and peripheral blood mononuclear cell of patients with breast carcinoma.

Materials and Methods

Patients with ductal invasive carcinoma of breast were selected for the study. These patients had biopsy-proved tumors and no treatment before surgery. The study material was defined as blood, tumor tissue and normal ductal epithelial cells. Peripheral blood was obtained by routine venipuncture. Tumor cells and normal breast tissue were collected by microdissection from sections of the postoperative breast specimen. Genomic DNA was extracted and methylation levels of LINE-1 were investigated by the combined bisulfite restriction analysis (COBRA-LINE1). Double digestion with *TasI* and *TaqI* enzymes was used for this purpose. Methylated amplicons (*TaqI*-positive) were digested into two 80bp fragments, while unmethylated (*TasI*-positive) amplicons yielded 63 and 97bp fragments.

Results

LINE-1 methylation showed variable levels, it was not uniform in different tissues of the same patient. In most tumors unmethylated sequences predominated with some level of them found in almost all DNA samples from tumors. While some blood DNA samples contained exclusively methylated elements. 90% of blood DNA specimens showed at least some level of methylation. Samples of normal breast tissue showed lower LINE-1 methylation levels comparing to blood samples and in some cases had LINE-1 methylation pattern similar to that of tumor cell DNA.

Discussion

Different studies report nonhomogenous findings on LINE-1 methylation status in tumors. In our small-scaled study LINE-1 hypomethylation was associated with cancerous properties of the cells. Most likely there are some locally-acting factors that alter LINE-1 methylation levels implicated in development and progression of tumors or LINE-1 hypomethylation is a secondary event following malignant transformation.

P29. Kartsivadze M.

Skin Diseases Related to the Climate in Batumi

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In the world there are various chronic diseases of the skin, which are considered to be a global problem, taking into consideration the complexity of their treatment. In dermatology, as it is commonly known, ultraviolet radiation is harmful for the human skin. The sun's rays, especially the excessive sunburn, do not make any good for the skin. Excessive ultraviolet radiation, except for the premature aging of the skin, may be a cause of severe disease, for example, skin cancer. If a person has a viral papilloma, spots, freckles,

keratomes (horny layers) or vitiligo on the skin, sunburn should be avoided, and if he/she is still in the sun, it is necessary to use special protective means.

The most common disorders of pigmentation are Vitiligo, Lentigo, Chloasma and others. They are common diseases, which according to different authors, can be 3-5% of all types of dermatoses and can occur at any age. Excessive ultraviolet radiation aggravates the risk of developing skin cancer. It is desirable that the public had information related to the use of ultraviolet radiation as well as the positive and negative aspects of the sun's rays.

Since ancient times, in the genesis of any skin diseases dermatologists have given primary importance to the human environment, the state of the body, nervous mental disorders, etc.

Thus, the problem of skin depigmentation and a number of genetics issues of various skin diseases, despite medical researches, is one of the unsolved problems of modern dermatology and requires in-depth study.

P30. Kikalishvili B., Gorgaslidze N., Sulakvelidze Ts., Malanya M., Turabelidze D.

Study of lipids of some plants growing in Georgia

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The aim of presented study was the investigation of some plants growing in Georgia: *Vitexagnuscastus L.* (fam. Verbenaceae), *Rutagraveolens L.* (fam. Rutaceae), *Persicavulgaris S.* (Rosaceae) on content of lipids.

Crude neutral and polar lipids were isolated from the samples. Fatty acids were identified by HPLC.

Some physical-chemical characteristics of the obtained oils and constituent biologically active compounds: phospholipids, carotenoids, vitamin C were determined by standard methods. Lipids of noted plants are widely used in practical medicine as antibacterial, fungicidal, antiinflammatory, sedative, cytostatic, and diuretic remedies. Lipid and biologically active compounds constitution of some plants growing in Georgia (*Vitexagnuscastus L.*, *Rutagraveolens L.* And *Persicavulgaris S.*) were studied for the first time.

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P31. Kiknavelidze N., Kvizhinadze. N., Delibashvili D.

Students and teacher's psycho-emotional factors during the study process at high institutions

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Overview and aim: Psycho-emotional factor is very significant in study process—it drives attention, which in turn drives learning and memory. But because we don't fully understand our emotional system, we don't know exactly how to regulate it in high institutions, beyond defining too much or too little emotion as misbehavior. We have rarely incorporated emotion comfortably into the curriculum and classroom. Further, our profession has not fully addressed the important relationship between a stimulating and emotionally positive classroom experience and the overall health of both students and staff.

Teachers (Professors) are more inclined to regard students as active participants in the process of getting knowledge than to see the teacher's main role as the transmission of information and demonstration of "correct solutions". What has recent psychological research taught us about learning and how can we best apply these findings to improve teaching and enhance student learning? Learners have distinct styles that influence learning. Especially important is whether a student has a prevention and promotion focus. A student with a prevention focus is especially sensitive to negative outcomes, seeks to avoid errors, and is driven by security concerns, while a student with a promotion focus is more sensitive to positive outcomes.

The influence of the social context and the learning environment on learning and achievement emotions was already emphasized by Pekrun et al. (2002). Instructional quality, value systems, concession of autonomy, expectations and learning and achievement goals as well as a teacher's achievement feedback are assumed to have an influence on students' emotions (Gläser-Zikuda & Fuß, 2008). Teaching is an emotional endeavor (Sutton, Mudrey-Camino, & Knight, 2009). Teachers may experience happiness when an instructional objective is met or students follow directions, frustration when students cannot grasp a concept, anger with misbehavior, disappointment with lack of effort and anxiety when their competence is challenged (Sutton, 2004).

Study object:

Learning involves a process of personal transformation. It requires students to develop a capacity for self-direction, self-monitoring, and self-generation of ideas. Study object was to underline the importance of psycho emotional factors, which influence during the study

process for Students and teachers. Specific questionnaire regarding the above-mentioned factors was fulfilled for the students of the Faculty of Pharmacy (English Medium) of Tbilisi State Medical University.

Result:

The positive and insignificant effect of positive mood on learning process has lent a good indication for further research to explore this phenomenon. As the study shows teachers take a significant role in improving the positive mood of students, keep the student away from bad mood, and encourage his/her students' mind to put full concentration only on a good learning process, which reflects on his/her academic performance. Teachers should have respect and concern to the student, give them appropriate assessment and feedback to help achieve their goals and intellectual challenge, independence, control, and active engagement.

Student's previous and future experiences and psychological qualities and attributes also play a critical role on successful social and academic integration to allow for successful transitions. The level of psycho-emotional state depends on personal experience of stressful situations that arise in students' life and during studying, especially when they are studying abroad and are far from the family.

P32. Kodanovi L.

Introduction of therapeutic, aromatic, exotic species in Batumi botanical garden and its results

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Medicinal plants play an important role in maintaining human health, the use of which is quite large.

The flora of Georgia is rich in medicinal plants, but anthropogenic impact on the natural phytocenosis of wild plant species leads them to a catastrophic decrease. This problem is relevant from the point of view of the economy, since modern production (food, pharmaceutical, etc.) using plant raw materials requires a guaranteed new material base, which can be achieved by cultivation, the method of administration.

Therefore, the purpose of the study was a primary introductory examination of some therapeutic and aromatic medicinal plants; determination of adaptive ability and quality of aromatic plants; bio-morphological research; Assessment of the introduction of introduced plants in Batumi Botanical Garden; due to these objectives, since 2015, we have begun to introduce several new, aromatic plants in Batumi Botanical Garden, plant them in the greenhouse of a collection of exotic plants and grow seedlings. In addition,

experimental sites has been allocated to aromatic plants in Batumi Botanical garden, where we managed to plant seedlings from a greenhouse into the open land. Observations and studies were carried out using phonological methods approved by the scientists of century-old Batumi Botanical Garden. On the basis of these observations it can be concluded:

The following species were able to successfully adapt and acclimatize the new environment

- *Polianthes tuberosa* L.; *Cuminum cyminum* L.; *Cassia angustifolia* M.Vahl;

Polianthes tuberosa is spread in tropical and subtropical zones, its homeland is Mexico. *Tuberosa* has many uses, one of which is important in perfumery and cosmetology because of the content of essential oils. Its dried tubers are used to treat gonorrhoea.

Homeland of *Cuminum cyminum* is Central Asia. The plant is cultivated in Central India, Southeast Asia, Iran, Afghanistan, North America and Latin America. It is less common in Europe except in the Mediterranean countries. Its fruits contain 2,4-4,0% of essential oils and 16% of gum. It has a positive effect on the cardiovascular system, prevents the formation of thrombosis and protects the entire body from a heart attack.

Cassia angustifolia, naturally grows in dry areas of North Africa, South Arabia, on the Red Sea beach. It is cultivated in India, Pakistan, Uzbekia, Azerbaijan as an important medicinal plant.

Medicaments of the *Cassia* tree are used in medicine as a laxative during long constipation. It also has a diuretic effect.

Plant material obtained from medicinal aromatic plants successfully introduced in the coastal zone of Adjara under subtropical conditions is used for further experiments on the content of biologically active substances.

P33. Kunchulia L., Gabunia K., Lekishvili N.

New Approaches to Standardisation of Georgian Propolis

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Today, the quality of the Propolis is evaluated not only by chemical-physical characteristics, but prioritizes of standardisation is the testing of their biological properties.

On pharmaceutical market the most demanded is green Brazilian propolis, because of its cytostatic efficacy. In last years, also subject of interest became propolis from Cuba, with anticancer activity. Propolis of Peru, China and Turkey has mainly hepatoprotective activity. The number of scientific works from different countries proves the correlation of antioxidant potential of propolis with its biological activity.

The aim of our work was to study the chemical composition and antioxidant activity of the Georgian propolis samples taken from various geographic regions: Svaneti, Racha, Tsageri, Chiatura, Khashuri, Kharagauli, Tskaltubo, Kaspi, Qareli, Gori, Martkofi, Dusheti, Kvareli, Shuamta, Alaverdi.

To study the chemical composition and antioxidant activity of samples was used spectral (UV- Spectrometry) and chromatographic (GC-MS) methods of analysis. Antioxidant potential was evaluated by well-established method of DPPH reagent use, with following UV-spectrometry.

The study results shows:

- High polyphenol content 35.7-77.9% in Georgian propolis;
- High to moderate antioxidant potential almost in each sample. For example, propolis from Kvareli region has the highest antioxidant activity, with the major decrement of 93.5%;
- In all samples of propolis the dominant compound is flavonon- pinostrobin. This substance separated from propolis has high antioxidant activity;
- It is truly visible the correlation between polyphenolic content, with antioxidant activity;
- In first time was identified, before never detected in Georgian propolis, compound benzofurane. Under the bibliography, this is the product with high anticancer activity.

Based on received data, Georgian propolis can be standardized by pinostrobin content and recommended to the pharmaceutical market as a biologically active agent.

P34. Kurdiani N. G., Dadegashvili M.D., Tsagareishvili N. T., Mikaia G. A., Zodelava D.G.

Development of Phagogel - topical preparation with antibacterial activity

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The bacteriophages, also known informally as the *phages* (term derived from Greek "φάγω" - "to devour") are the viruses that selectively damage bacterial cells. One of the fields of application of the phages is an antibacterial therapy - an alternative to conventional antibiotic treatments for bacterial infection.

In recent years, there has been an increasing interest in phage therapy: the species and strain specificity of bacteriophages allows targeting of specific microorganisms and makes it unlikely that harmless or useful bacteria will be killed when fighting an infection, thus ensuring the preservation of normal microflora; the possibility to use mixture of

phages with different specificity allows destruction of various bacteria simultaneously; their role is significant in the treatment of antibiotic-resistant infections; together with these, phages tend to be more successful than antibiotics in penetration through polysaccharide layers of microorganisms.

World Health Organization warns that the 'post-antibiotic' era is near threatening our ability to treat common bacterial infectious diseases. In such environment, phage therapy becomes a promising area the development of which will promote the elaboration of new effective methods of treatment.

Our goal was to develop phage gel with antibacterial activity, which will be used after appropriate tests and trials as a topical preparation for dermatological use and as a wound-healing remedy.

The gel contains following ingredients: sterile, purified filtrate of phage lysate of bacteria of the genus *Staphylococcus* – 30 ml; green tea extract – 0.3g, grape (*Saperavi*) leaf extract – 0.5 g. Excipients: carbopol – 0.5 g; propylparaben – 0.007g; sodium hydroxide – 0.5g, purified water – up to 100 ml.

Bacteriophages of genus *Staphylococcus* were isolated from wastewater samples collected at various places.

Morphological characterization of the bacteriophages was done by transmission electron microscopy; phages MB10 and MB12 belong to the family *Syphoviridae*, while phage MB14 belongs to *Myoviridae*.

Assay was based on well-known Gratia method: 1 ml contains not less than 10^5 Bacteriophagum *Staphylococcus* spp.

Adsorption rate of bacteriophages on the host-cells: for phage MB10 corresponds to 10 min (90%); phage MB12 – 10 min (88.9%); phage MB14 – 15 min (89%).

Bacteriophage growth latent period length and burst size: for phage MB10 latent period length corresponds to 73 min, burst size – 122(+25) phage particles; for phage MB12 latent period length is 30 min, burst size – 155 phage particles; for phage MB14 latent period length is 45 min and burst size 222 phage particles.

Addition of the green tea and grape leaf extracts to the composition is stipulated by their phytochemical constituents (flavonoids, catechins, xanthenes, amino acids, vitamins, saponins, microelements) characterized by defined anti-inflammatory, antiseptic, toning, antioxidant effect. Total flavonoid content was determined by spectrophotometric method and expressed in terms of quercetin equivalent (wavelength 415 nm; content – 0.07%).

For complete characterization of the dosage form additionally were determined following parameters: pH 6.5–7; phase stability was studied by centrifugation (5 min, 6000 rpm) – no phase separation was observed; rheological properties were studied using viscometer: the decrease in viscosity is observed with increase in the rpm (at 20 rpm – 2050 poise; at 90

rpm – 625 poise), gel is characterized by non-Newtonian behavior and complies European Pharmacopoeia general monograph requirements for topical semi-solid preparations, including test for sterility.

Summary: topical preparation phagogel with antibacterial activity has been developed; process of elaboration included preparation of sterile, purified filtrate of phage lysate of bacteria of the genus *Staphylococcus*, preparation of green tea (*Thea viridis*) and grape leaf (*Vitis vinifera*) dry extracts, physical and chemical characterization of active ingredients, development of specification and methods of analysis for dosage form.

P35. Kvizhinadze. N., Dugashvili N., Kiknavelidze N.

Pharmacoeconomical peculiarities of Medical service in Georgia

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Overview and aim:

Pharmacoeconomics has been defined as the description and analysis of the cost of drug therapy to healthcare systems and society. pharmacoeconomic research is the process of identifying, measuring, and comparing the costs, risks, and benefits of programs, services, or therapies and determining which alternative produces the best health outcome for the resource invested.

One of the modern prospective direction is the pharmacoeconomical service area in which the special place belongs to the health care. It plays a great role in solving the social problems of the population. Because the offer and use of the service is a simultaneous process, health care organizations have difficulties in increasing and demanding demands. It is impossible to provide services, such as goods, pre-production and creation of supplies.

Therefore, health care organizations should pay special attention to managing the demand. The goal of the research is to identify the dependence of Georgian consumers on the medical service of the Georgian healthcare service, to develop the relevant recommendations for the pharmacokinetic issues of the behavior of consumers in the health service market in Georgia.

Study object:

The theoretical, methodological and statistical methods were used during the studies. Among the scientific innovations the following was important: implementation the customers' behavior regarding the pharmacoeconomical specifics in medical service market; defined customers' role for medical services, their equitances in the area of medical

service; Determined the role of information for paid medical services to consumers, Sources of awareness and environmental impact on them.

Medical services in the field of pharmacoeconomic is considered to be more in service increasing changes, their inner complexity and service pharmacoeconomical adaptation of nonstandard problems with consumers diversity, as well as the range of service range (Personalization of consumer demand for services). At the same time increasing competition in the field of paid services that requires development of effective service delivery system.

Result:

As a result of review and analysis of the materials, it is clear that the use of Pharmacoeconomical peculiarities of Medical service in Georgia is important not only for health care institutions, but for health management state bodies. In addition, it is important to increase the role of the state in regulating the issue in order to promote healthy competitiveness among the suppliers and improve the quality of medical care.

P36. Makaradze E.

The healing properties of genus *Galanthus L.*

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Introduction and Purpose of Research: Genus *Galanthus L.* is widespread in the Caucasus. There are 10 species of genus *Galanthus L.* in Georgia. The Snowdrops are distinguished as high decorative, as well as medicinal properties. In abroad increasingly demanding for the plant bulbs. In the territory of the Autonomous Republic of Adjara, large number of bulbs of the mentioned plant are collected and taken abroad. Today the introduction and use of phytoprefactors in medical practice is a promising field. The samples studied by me examine special attention to biological activity.

Research Methodology: Phytochemical analyzes of samples of target research were conducted. Sample examination was conducted in Batumi Shota Rustaveli State University ,Phytochemical Laboratory.

Results: Due to the obtained results, the bulbs of Snowdrop species contain alkaloid galantamine. In clinical practice, galantamine is used in the treatment of residual pneumonia, myasthenia and myopathy, polyneuritis and radiculitis, nervous system traumatic injuries. Galantamine is a potent inhibitor of cholinesterase enzyme activity, and

increases the sensitivity of the neuromuscular system to acetylcholine. Like physostigmine and neostigmine galantamine stimulates the secretion of salivary, mucous and sweat glands, increases contractility of uterine smooth muscle and intestinal peristalsis. Glinamine promotes restoration of damaged muscles, improves motion function and general condition of patients. So according of these, genus *Galanthus* L.is very valuable in Adjara region.

Conclusion: Based on the researches we can boldly say that the *Galantus* L. Bulbs contain many alkaloids, including gelatamine, which is widely used in medical practice and preparations used for the treatment of many diseases.

P37. Matchutadze I.; Tetemadze N.; Tsertsvadze A.

Role of sphagnum peat in the regulation of Kolkheti climate

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Peat, due to its unique quality, which is expressed in the accumulation of carbon, have special role as softening eco-system of climate's change. Ramsar's convention, climate's change frame-convention and agriculture and provisions international organization (FAO) underlines necessity of restoration of draining peat and development of agriculture adopted to flooding. Restoration of degraded peat will stimulate reducing of greenhouse gas's emission in atmosphere.

Protected territories of Kobuleti, protected by Ramsar's convention as having international value of the best management of over-saturated habitats will play special vital role in carbon sequestration and will become soften measure of changes in climate.

Conservation of peat economically is effective for reducing greenhouse gas's emission. It is calculated, that in natural way conservation and restoration of peat will reduce emission of carbon from 4.0 tones to 1.5 tones annually on one hectare.

There is dual dependence between climate and peat: Climate of Kolkheti reacts on peat and peat itself stimulates regulation of climate of Kolkheti. Large amount of water accumulated in peat makes balance in the climate of Kolkheti. In warm and dry weather due to water's constant evapotranspiration, they represent cooling device.

P38. Masiukovich T¹.

Study of the sulphide silt peloids of some Adjara region lakes on the content of biologically active compounds

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The use of the natural healing factors for the treatment and prevention of various diseases presents the one of the actual tasks for the modern medicine.

The healing muds, so called peloids, hold a special place in balneology and resort therapy due to their great therapeutic effects. They belong to useful mineral resources and contain biologically active compounds, such as, lipids, organic acids, micro-, macro-elements, enzymes, hormone-like substances, hydrogen sulfide etc.

Georgia, along with other mineral resources, is the one of the richest countries in peloids. Therefore, for the purpose of the economic development of the country, the interest to the studying and application of medicinal muds is great.

Adjara is one of the regions of Georgia, rich in peloids resources, which can be found on the seacoasts, as well as in the mountains. These resources have been known to the local population since the ancient times and have been widely used for the therapeutic and preventive purposes.

The aim of our research was to study the content of lipids, organic acids, micro- and macro-elements of the sulphide silt peloids of some Adjara region lakes.

The objects of the study were the sulphide silt peloids of the following lakes of Adjara region: Mtsvane, Gasaliani, Shratiani, Nurigeli, Ardagani and Niphi.

For extraction of lipids and organic acids from peloids the ethanol-hexane (1:6) mixture has been used. The identification of the extracted lipids and organic acids has been carried by the Gas Chromatography-Mass Spectrometry (GC/MS) method of analysis.

The content of micro- and macro-elements has been determined by the modern instrumental method of analysis, by using Epsilon 5 EDXRFspectrometer.

The results of the carried analysis have revealed, that the samples contain lipid complexes and organic acids of natural origin, which take a special role in peloids therapeutic action and along with the other constituent components determine the application of peloids for medicinal and cosmetic purposes.

In the analysis of objects it has been also established the content of the important micro- and macro-elements for the human organism, such as, Magnesium, Silicon, Sulfur, Phosphorus, Potassium, Calcium, Iron, etc.

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Healthy Plants – Healthy People

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Biosecurity and biosafety problems are the serious concern for our country and because of the high risk of natural infections the plant diseases recognize no borders. They can seriously damage security of the country's production through yield loss and poor quality of agricultural crops. Our organization has been involved in plant disease surveys and pathogen diagnostics for many years. The Culture Collection of Plant Pathogens, established in 2005 through the ISTC G-1093p project comprises plant pathogens with various virulent and pathogenicity levels attributed to the risk group 2. Our culture collection involves also the other pathogenic microorganisms, such as *Fusarium oxysporum*, *F. sambucinum*, *F. solani*, *F. moniliforme*, *F. avenaceum*, *F. graminearum*, *Aspergillus* sp, *Mucor*, *Rhizopus*, *Cladosporium*, *Penicillium* sp. which at the same time cause the serious yield losses of agricultural crops and during their parasitism on plants produce dangerous toxins causing contamination, allergy and skin diseases of human and animals.

In 1993, the United Nations classified aflatoxins as carcinogens of the first class. Especially a lot of aflatoxins secrete fungi *Aspergillus flavus*, *A. parasiticus*. They are contained in products of plant origin, but on food chains fall into livestock products. The greatest risk is the consumption of milk, eggs and meat.

P39. Merlani M., Amiranashvili L., Gogilashvili L., Barbakadze V.

Synthesis of dihydroxylated derivatives of ferulic and isoferulic acid

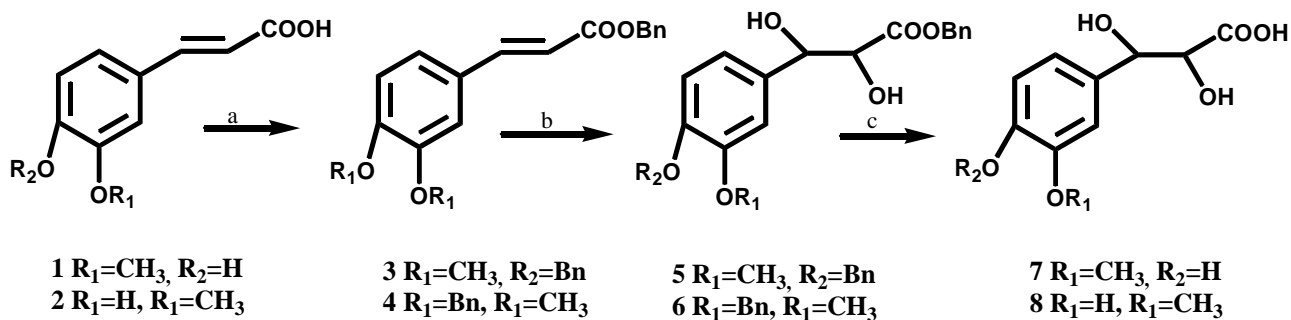
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Phenolic compounds play a very crucial role as antioxidant that can prevent various diseases caused by free radicals in human body [1]. Recently new phenolic polymer with high antioxidant activity – poly-[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)-ethylene] was isolated from roots and stems of *Symphytum asperum* and *S. caucasicum* [2]. The repeating unit of this polymer, 3-(3,4-dihydroxyphenyl)-glyceric acid, synthesized in a racemic as well as in enantiomeric forms showed high antioxidant activity [3].

In order to determine the influence of substituent effect on antioxidant activity some new dihydroxylated derivatives of ferulic and isoferulic acid have been synthesized.

Hydroxy and carboxy groups of ferulic **1** and isoferulic acids **2** were protected by benzyl bromide in acetone and synthesized esters **3** and **4** were dihydroxylated using potassium osmate as a catalyst and *N*-methylmorpholine as a co-oxidant. Debenzylation of esters **5**

and **6** by hydrogenolysis on Pd/C gives desired new phenolic acids **7** and **8** in quantitative yields.



a) $BnBr, K_2CO_3$, acetone, reflux

b) $K_2OsO_4 \cdot x H_2O$, NMO, acetone/ CH_3CN/H_2O

c) H_2 , Pd/C, EtOH/THF

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P40. Mindiashvili N.; Zazashvili N.; Chichakua M.; Kunchulia L.; Chikaidze M.

Modern Aspects of Standardization of the Biologically Active Substances in the Additive Feed "Rumifos"

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In the recent years, the demands on the preparations of the natural origin, which are the separate groups of the biologically active substances or their mixtures, has been increased. The success of these preparations is due to the existed evolutionary and harmonious coexistence of the separate substances. Additive feed "Rumifos" is the total preparation of biologically active substances. It has been received from the endemic cultures (*Triticum durum*, *Avena sativa*, *Hordeum vulgare*, *Zea mays*) by extraction. The unique technology of the product receipt is based on the method of the dry distillation in a modified medium

and by the method of selective mixing of the different fractions. The production technology and trade mark of "Rumofis" is the ownership of BrTRC and the copyright is protected. The substance of "Rumifos" is the multi-component heterogenic plant liquid extract. Standardization of the product is too difficult because of its multi-component and different structural substances.

The Goal of the Research: for the standardization of additive feed "Rumifos" – the selection and validation of the physic-chemical method of the modern informational analyses for the identification of its substances.

The Method of the Research: spectrophotometer in ultrasound areas, Mark- "Shimadru" (Japan). The gas chromatography with mass spectrometry. The gaschromatography – mark HPLC (Water) detector.

- We chose the modern informational and reliable method – the gas chromatography with mass-spectrometry for the identification of the substances of "Rumofos". After the use of this method, more than 170 substances have been revealed in these substances.
- Substances have been classified on the base of their structure.
- 3 groups have been identified: Biopolonids, sugars and hetero-cycle mixtures.
- Biopolonids are the dominant substances in the additive feed "Rumifos". The spectrometry method of their quantitative definition has been carried out. The quantity of biopolonids is 0,85 – 3,2%.

P41. Mishelashvili Kh.T., Tsikarishvili Kh.J., Metreveli I.Z., Batsikadze K.T., Gvinjilia S.A.

Developing the concept of creating emulsion systems for making of cosmetic milk

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The general conception of creation of liquid creams (cosmetic milk) recipes in literary sources is not available at present. The promotional products include cosmetic milk prescriptions of various companies, but usually do not reveal the full composition that gives the possibility to obtain stable in time colloidal emulsion systems. In the few patents and scientific publications, as a rule, exists a know-how that does not provide full access to information.

The cosmetic milk belongs to lyophobic dispersal systems, which are thermodynamically unsustainable because the Gibb's energy level on the interphase surface is rather high. Its reduction would be achieved through the reduction of interphase surfaces, or by the addition of a certain quantity of emulsifiers and structure generating substances, due to

the change in the value of interfacial tension. As a result, it is necessary to increase the sedimentary stability as well as to reduce the probability of aggregate sustainability. There are a number of other to be considered indicators, for example, dispersionability, chemical properties of surface-active substance, emulsion type (o/w or w/o) that is determined by molecule geometry, as well as energy of the phases interaction, value of hydrophilic-lipophilic balance. By changing the nature of emulsifier and its concentration, it is possible to achieve the transformation in emulsion phases that is also not less important for stabilization. At the selection surface-active substances, physical and chemical properties of the entire system and the area of emulsion application should be considered, possible chemical interaction between the surface-active substances and components of phase, their biological activity. Currently is existing a wide range of surface-active substance of distinctly different group with almost similar emulsifying ability. Due to the existing data, the application of having various chemical structures surface-active substances mixture gives the effect of increased emulsion stability. In addition, it is possible to create more dense and well-formed clusters of the molecules on surface and, as a result, the intermolecular interaction of surface-active substances on the border phases. The most effective mixed stabilizers are ionogenic and non- ionogenic mixtures of surface-active substances.

Introduction of composition of structural generating substances - this is actually an additional stabilization of emulsions. The selection of physical-chemical properties of the structure generating substances, due the orientation on their chemical structure, gives the possibility to making of required consistency and colloidal stability of the cosmetic milk. The certain combinations of the creation of cosmetic milk prescriptions, according to their physical-chemical properties, gives the possibility to them to increase their stability due the decreasing of probability of phase delamination, even at the sharp change of pH value. The available data on various structure generating substances properties, at their application in cosmetic milk by change of physical-chemical properties, is possible not only by additional stabilization, but also the nourishing properties of cream - resorption of water, glycerin and ethanol, the achievement of distribution on the cutaneous covering, at delay on skin and replacement of others.

Proceeding from the above mentioned at development of cosmetic milk formulation for obtaining of stable emulsion system is necessary to select the stabilizer or mixture of surface-active substances, establish the interaction between the characteristics of initial components and properties of finished composition that gives the possibility for obtaining of aggregative stable emulsions.

P42. Murtazashvili M., Chikviladze T., Murtazashvili T.

Simultaneous identification of metabolites of synthetic cannabinoids JWH-018 and JWH-073 in urine using LC-MS/MS method

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Synthetic cannabinoids are compounds that were originally synthesized by scientists around the world to study the interaction of these compounds with endocannabinoid CB1 and CB2 receptors. As these compounds became more readily available, a market for recreational drug ensued. These compounds are constantly being modified and mixed with herbal products and are sold as incense under many brand names such as Spice, Spice Gold, Aroma, K2, Kush, Spike 99, etc. These compounds have a high potency for cannabinoid receptors and cause a variety of toxicological symptoms.

These synthetic cannabinoids can be modified structurally and easily synthesized in labs. This makes measuring them in forensic drug screening a challenge. Forensic drug screening has traditionally relied on immunoassays and then analytical confirmation with a quantitative method such as GC/MS or LC/MS. Due to rapid metabolic transformation, the native synthetic cannabinoids are not detectable in urine samples and then the analytical methods must be based on the identification and quantification of their metabolites.

Many synthetic cannabinoid drugs undergo extensive metabolism, via oxidation (hydroxylation) at multiple sites, on the aryl or naphthyl substituents, the indole ring, and on alkyl side chains. The correct identification of these metabolites in the urine samples requires the use of authentic standards. Simple, robust and precise analytical methods are needed to quantitate these now illegal compounds in biological matrices for forensic purposes. Here we will focus on JWH-018 and JWH-073. Research has shown that parent compound is not excreted in urine. The reported metabolites seen in urine are the alkyl-hydroxy and alkylcarboxy metabolites of each compound.

Calibrators and QCs are prepared by spiking JWH 018 N (5 hydroxypentyl), JWH-018- N-pentanoic acid, JWH-073-N-(4-hydroxybutyl), and JWH-018-N-butanoic acid, into blank urine and extracted with ethyl acetate-isopropanol- ammonium hydroxide (85:13:2 v/v).

Analysis was performed on Agilent technologies 1290 Infinity Agilent technologies 6460 Triple quad LC-MS/MS system. Separation was performed by elution on Zorbax Eclipse plus C18 (100×2.1 mm, 1.8 μm) column, equipped with pre-column: UHPLC GUARD Zorbax Eclipse plus C18 (5×2.1 mm, 1.8 μm); column temperature was 35°C. The mobile phases consisting of 0.1 % water solution of formic acid : 0.1 % acetonitrile solution of formic acid (20 : 80 v/v). The flow rate was 0.45 mL/min.

Determination was performed on triple-quadrupole massspectrometer employing electro spray ionization technique (ESI⁺) operating in multiple reaction monitoring (MRM) at

positive ion mode. Total chromatographic run time was 5 minute. Two transitions were monitored for each compound.

Method was validated on following parameters: Specificity, Linearity, LOQ, LOD, Accuracy, Precision, Recovery and matrix effect.

A simple dilute and shoot method for the analysis of synthetic cannabinoid metabolites in urine was developed for forensic toxicology use. The method is linear from 5 to 100 ng/mL with R^2 values greater than 0.99 for all compounds. A 5 minute run was required to chromatographically separate the analytes of interest from endogenous interferences.

P43. Murtazashvili T.¹, Sivsivadze K.¹, Bokuchava N.¹, Murtazashvili M.¹

Development of HPLC method for determination of Rutin in the canes of Rkatsiteli variety

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A simple, selective and rapid high performance liquid chromatographic (HPLC-DAD) method for the analysis of Rutin has been developed. Rutin is a polyphenolic naturally occurring compound, found in many plants. Rutin is phytochemical with multi-spectrum pharmacological benefits, such as antimicrobial, antiallergic, cardiovascular, antiarthritic, antiulcer, antiosteoporotic, ophthalmic, diuretic, hepatoprotective effect. It is also used for the treatment of various chronic diseases, such as diabetes, hypertension, hypercholesterolemia, prevention of neuroinflammation; It has carcinoma therapeutic activities, decrease capillary fragility as well as have nutraceutical benefits. Over 860 pharmaceutical products containing Rutin are currently marketed in the US. Very good dietary sources of Rutin are buckwheat, amaranth leaves, elderflower tea, apple, unfermented rooibos tea, figs. Vine, lemon, asparagus, spring perennial vegetable are rich in Rutin. Sophora Japonica, citrus and different species of eucalypts are used for manufacturing Rutin.

Present work was undertaken with the aim to develop a rapid and consistent analysis method for extraction and determination of Rutin in the canes of grapevines.

Grapevines cane is waste product from viticulture, and it is important to develop methods of Rutin extraction from the grapes cane and for its determination. Extraction process has been focused on the discovery and design of green and sustainable extraction techniques to optimize the recovery of Rutin. As the material in this work it was used cane of the Rkatsiteli vitis variety, gathered in Kakheti region. Rutin extraction method with double heating has been developed, extraction solvent was ethanol 50%. For purification was used double step liquid-liquid extraction using chloroform as isolating agent.

Analyses were performed using high-performance liquid chromatography AGILENT TECHNOLOGIES 1290 Infinity. Separation was performed by gradient elution on Zorbax Eclipse plus C18 (250×4.6 mm, 5µm) column. The mobile phases consisting of 0.1 % water solution of formic acid (HCOOH (H₂O)): 0.1 % acetonitrile solution of formic acid (HCOOH (CH₃CN)). Injection volume was 5 µl, flow rate 0.8 mL/min with DAD detection at 254, 270, 335 nm. Run time 15 minutes. The method was validated on following parameters: selectivity, sensitivity, precision, accuracy, linearity, recovery and stability.

The results of the present study was suggested a simple, rapid method for the extraction and determination of Rutin in the cane of grapevines.

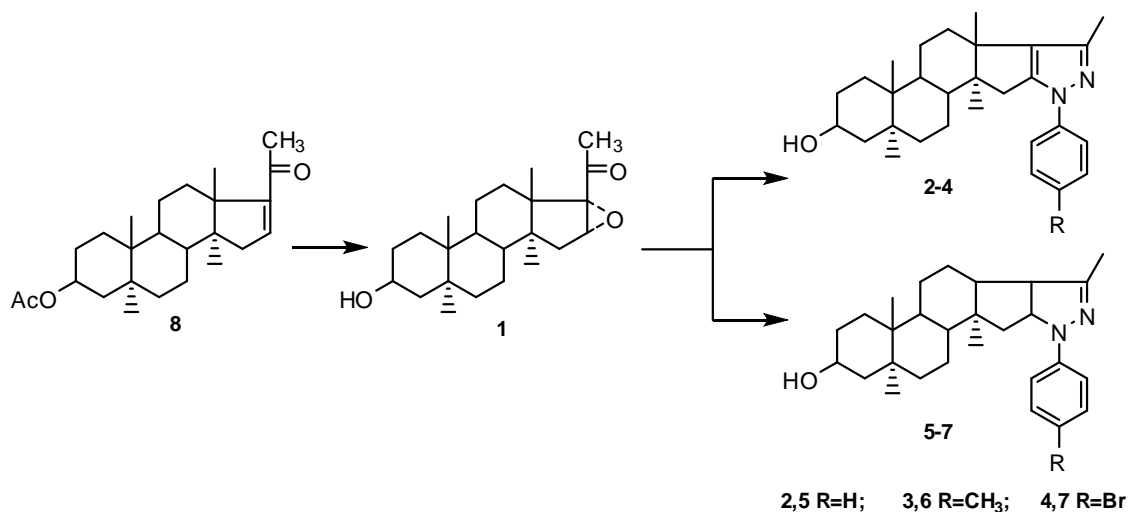
P44. Nadaraia N. Sh., Kakhabrishvili M. L., Barbakadze N. N.

Synthesis of 3β-hydroxy-1'-aryl-3'-methyl-5α-androstano[17,16-d]pyrazoles

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Steroidal pyrazoles are an important class of heterocyclic compounds, which are characterized with the high antimicrobial, anticancer and anti-inflammatory activities, that's why elaborate of new method for the synthesis of nitrogen-containing heterocycles condensed with steroids and study their biological activities is actual [1,2]. For this goal condensation reactions of 16α,17α-epoxy-5α-pregnan-3β-ol-20-one **1** with some hydrazines (phenylhydrazine, p-methyl, p-bromophenylhydrazine) in protonic solvents (ethanol, ethylene glycol, acetic acid) and nonprotonic solvent (DMF) on different temperature have been studied. In all cases obtained complicated mixture. By column chromatography 3β-hydroxy-1'-aryl-3'-methyl-5α-androstano[17,16-d]pyrazoles **2-4** and their corresponding 3β-hydroxy-1'-aryl-3'-methyl-5α-androstano[17,16-d]pyrazolines **5-7** have been isolated.



The starting ketone **1** have been received from 3β-acetoxy-5α-pregn-16-en-20-one **8** in alkaline methanol with hydrogen peroxide. Steroid **8** is transformation product of tigogenin.

The structures of the synthesized steroids **2-7** established by IR-, NMR(¹H, ¹³C, DEPT, HMBC)-and mass-spectral datas.

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This work was supported by Shota Rustaveli National Science Foundation (SRNSF) (217560, "Synthesis and pharmacological research of potential bioactive nitrogen-containing 5α-steroids")

P45. Neparidze M., Gelovani N., Gvelesiani I., Gigoshvili T.

Wild and cultivated hazelnut (*Corylus avellana*), almond (*Prunus dulcis*) and walnut (*Júglans régia*) crops in Georgia and about their use in ancient Georgian historical monuments

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We studied wild and cultivated hazelnut, almond and walnut distribution areas and species in Georgian regions.

The species of hazelnut local (endemic) and introduces recommended for production are

1. "Anakliuri" (synonym: "Puqturama")
2. "Gulshihvela"
3. "Dedoplis Titi" (synonym: Akaki Tsereteli's hazelnut, "Damski Palchik")
4. "Vanis Tetri"
5. "Vanis Tsiteli"
6. "Imeruli" (Imereti N21)
7. "Legi" (Imereti N27)
8. "Ucha hazelnut" (Synonym: Kerasundis tsvrili, Tombuli).
9. "Nemsa"
10. "Shveliskura"
11. "Chkhikvistava"
12. "Tskhenis Dzudzu" (Synonym: "Tskheniskbila"
13. "Kharistvala" (synonym: Khodji hazelnut)
14. "Khachapura".

Hazelnut also has healing properties. In ancient Greek folk medicine, treatment with hazelnut oil is known for the anemia, epilepsy, hair loss and for various diseases. Hazelnut fruit husk decoction is taken during excessive obesity; decoction of leaves cleans up the blood and is used for treatment of atherosclerosis and calculous disease. Besides, hazelnut contains substances that remove the harmful substances form the human body and help to strengthen immune system.

Almond belongs to the family Rosaceae. More than 40 species are combined in almond family. In Georgia local species of almonds are known, such as, "Gika" "Shiraqula" "Dzegvuri", "Shakara", "Tkheldachucha", "Lisi" and others.

Almond (*Prunus dulcis*) crops are mentioned in Georgian ancient historiographic sources three thousand years ago BC. In Vakhushti Bagrationi's work – "Description of the Kingdom of Georgia" almond also mentioned with other fruit. In the 13th century, in the pages of "Book on Medicine" along with various medicines, almond and its oil are named. For example, for treatment of kidney pain, ear disease, urinary tract and other diseases.

Walnut (Latin. *Juglans regia*) belongs to the family Juglandaceae, is a flowering tree. It is distributed in almost all regions of Georgia. It creates small groves, mostly are single trees. The biggest groves are on the banks of Alazani. Walnut in riverbank is mixed with oak, elm and hornbeam.

In Georgian folk medicine, they use pericarp and young green fruit against eczema; they are cut and applied on eczemic areas. Walnut oil is used for treatment of conjunctivitis and otitis. You can use pericarp for tanning leather; leaves, crust and pericarp are used for dyeing cloth, wool, carpets and hair in reddish or brown color.

P46. Nemsitsveridze N., T.Tchumburidze, T. Zarqua, N, Dugashvili, K. Gurchava

Recipe Reform in Tbilisi Pharmacies

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For more than 20 years the medication prescription has stopped functioning in Georgia. Accordingly, it was possible to buy on Georgian market any medication without prescription, except narcotics and psychotropic drugs. From February 1, 2014, the Ministry of Labour, Health and Social Affairs of Georgia started gradual introduction of the prescription reform.

According to the order N01-53 / N, dated 18th of July, 2014 by the Minister of Labour, Health and Social Affairs of Georgia, was approved the procedure for the prescription of recipe for the pharmaceutical product (medical) of the second group and the form of N3-recipe form.

We considered it interesting to study the impact of the reform on pharmacy services. Accordingly, the **goal of the study** was to find out the pharmacists' attitude towards this innovation and see how effectively the reform works in Tbilisi pharmacies

Research Methods: The study was conducted by survey. 50 pharmacists of Aversi, PSP, GPC, Pharmadepot and Pharmaceutical House were interviewed. For more objectivity the poll was conducted anonymously. Respondents were indicating only their working company.

As a **result** of the conducted research, we determined that, most pharmacists positively assess the establishment of the prescription reform (54%), pharmacist is responsible for drug delivery in pharmacies, and they themselves control this process. 72% of respondents think that the introduction of the prescription has not limited the competence of pharmacist care. In 89% of respondents' opinion, prescriptions that are received in pharmacies are controlled daily. The results of the research revealed the actual problem, such as selling the prescription type medications without prescription.

Conclusion: we can note, that developing the prescription reform in Georgia is a step made forward. The medical community eagerly welcomes this change. The doctor's competence and authority was elevated; Specific rules of issuing medication with pharmacist's prescription and prescribing medications by doctors are gradually settling. With the obvious positive sides also are evident significant systemic errors and technical shortcomings. Selling the second group of medicines without prescription is a risk factor for the introduction of prescription reform, but we hope this issue will be solved soon.

P47. Nikuradze N.¹, Buadze K.², Grdzlishvili Sh.¹

Market access of the generic drugs in the European Union, United States of America and Georgia

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As generally known, generic drugs are copies of brand-name drugs [hereunder as brand-name drugs, reference drugs or original] and are available in both over-the-counter and prescription form. The subject of this abstract is to outline regulations of market access of the generic drugs in the European Union [EU] and United States of America [USA or US] in comparison to Georgia and to provide relevant recommendations.

For the purposes of the research as a methodology the comparative and quantitative analyses were in use.

Consequences of the research revealed that the regulations of generics in EU and US are in general the same but it has slight, but considerable differences.

The generic product is defined in the European and US in the same way, and as given in EU Directive 2001/83/EC, 'a product which has the same qualitative', i.e. kind of active substance, 'and quantitative', i.e. amount of active substance, 'composition as the reference medicinal product'.

In EU the generics flow under the motto: quality, safety and efficacy, while in US it is called "Safe, Effective, FDA –approved". In the numbers, generics are responsible for 56% of the total volume in Europe [but not value], whereas in US generics account for more than 80% of prescription drugs, and that number continues to grow.

While the generics shall have to serve as the copy of the originals, it should be pharmaceutically equivalent to the reference product. For that purpose, relevant approvals are needed that are strictly regulated under the European and US systems. EU as well US demand bioavailability or bioequivalence trials, in order to demonstrate the equivalence between the generic medicinal product and the reference medicinal product. Next to these trials, the list of requirements exist: the manufacturer is capable of making the drug correctly and of making the drug consistently, the "inactive" ingredients of the drug are safe, the drug does not break down over time, the container in which the drug will be shipped and sold is appropriate, the label is the same as the brand-name drug's label.

And as a last, both EU as well as US knows market exclusivity and patent as property right that should be expired before market access for the generics is granted. The terms of market exclusivity differ, 10 plus 1 year in EU, and in US from 180 days to 7 years, while the patent run for 10 to 11 years.

The market access term in EU is up to 2 years and more, while in US it is 20 months and more. As per Georgian law, generic pharmaceutical product is defined, as pharmaceutical product that is "international off-patent" and "repeatedly manufactured". 95% of the Georgian pharmaceutical market holds generics [but not value]. For the market access, bunch of data is required among them data on bioequivalency. The exclusivity is not envisaged, while patents

regulated under the patent laws generally determine 20 years and for the medical product with extension possibility. The terms for registration is specified as 4 months.

To conclude, as it follows out of the research, the market access of generics in Georgia shall meet more distinctive and enhanced procedures under the relevant laws. As a model, it might be used EU or US standards [procedures, terms]. Next to it, as the terms of the patent protection significantly differ, a careful balance must be struck between patent protection and free competition.

P48. Nishnianidze M.V. Tsikarishvili X.J. Shashiashvili N.V. Metreveli I.Z.

Development of the Dentifrice Water Formulation by Using of Distributed In Flora of Georgia Biologically Active Substances

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Currently treatment of teeth and oral cavity is one of the topical tasks for pharmaceuticals. A large number of papers are published on oral cervical disorders, as well as treatment and prophylactic remedies. With taking into account a rather rich flora of Georgia, including plants that have anti-inflammatory, antibacterial, antiseptic and so on activity, creation of new, effective remedies represents a topical task. The production of dentifrice water tooth by application of Georgian raw materials and expansion of world market is not only scientific innovation, but also has economic effect.

At development of elixir formulation, the existing literary data on the chemical composition of the ingredient and biological activity were taken into consideration. The alcohol-water extract from the leaves of the scum, tinctures from the fruits of hawthorn, grass and leaves of motherwort, leaves of eucalyptus, mint grass was used. The latter two provide also aroma of dental toothpaste.

The antiseptic, anti-inflammatory and tanning effect is achieved by using a tannoid extract from the leaves of scumia or sumac.

Anti-inflammatory, antimicrobial, bactericidal, biostimulating, and disinfecting effect has the entire complex of substances contained in selected tinctures and extracts - tannins and other phenolic compounds, carotenoids, oils, sesquiterpenoids and so on. The epithelizing, healing, vitaminizing effect on the mucous membranes makes the carotenoids, vitamins A, PP, K, vitamins of B group, etc. existing in tinctures of mint, motherwort and hawthorn. The presence of A and E group vitamin in hawthorn fruits in combination with a tincture of eucalyptus leaves, containing monounsaturated and polyunsaturated acids, creates a sufficient antioxidant effect. The application of mineral waters "Chargali" and "Utsera" with certain content of elements, in

the dentifrice water formulation gives the intensification of connective tissue collagen synthesis, mineral elements gum and teeth saturation remedy, makes the inhibition of inflammatory reactions, stimulate the regenerative processes in the epithelium cells of mucous in oral cavity. The water "Chargali" contains 1650 mg/l - of sodium, 440 mg/l of calcium, 150 mg/l of magnesium cations, 5100 mg/l of bicarbonate ion, 1200 mg/l of chlorine ions. The water "Utsera" contains: HCO_3^- - 4,2-7,9 g/l; Na^+ - 1,2-2,4g/l; potassium contents varies from 4.9 mg/l - up to 7,9 mg/l, divalent iron content of 15-17 mg/l, contains lithium and strontium. Both water contains microelements that are needed for gingival nutrition - boron, vanadium, manganese and other compounds. In order to maintain microbiological and colloidal stability, ethyl alcohol content will be no less than 25-30%. Due taking into account the existence in the dentifrice water composition of a large number of biologically active substances that have the ability to self-rusting, is necessary together with ethyl alcohol, the existence of a preservatives that provides stability and expire of the elixir no less than one year.

P49. Novikova Zh., Sulakvelidze M., Alania M., Sichinava M., Sutiashvili M.

Phenolic compounds of *Ononis Arvensis* – prospective gastroprotectors

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For over a century, gastric ulcer (GU) is one of the most common, chronic gastrointestinal disorder affecting a large number of people worldwide. Prescription drugs such as proton pump inhibitors, H_2 blockers, antacids ultimately balance the aggressive and defensive factors. At same time, they are liable for adverse effects. Contrariwise, plant extracts are among the most attractive sources for developing new drugs and have been shown to produce promising results in the treatment and prevention of gastric ulcers [1]. Phenolics are of great importance for the prevention of various human illnesses including GU mainly due to their antioxidant, free-radical scavenging and PgE_2 formation stimulating properties. The aim of present study was the determination of ulcer preventing activity of phenolic compounds from the restharrow (*Ononis arvensis* L.), which is used in folk medicine for treatment of various diseases. Crude phenolics from the overground parts (CPOA) and purified fraction (PFOA) were evaluated in ethanol induced GU model in rodents [2].

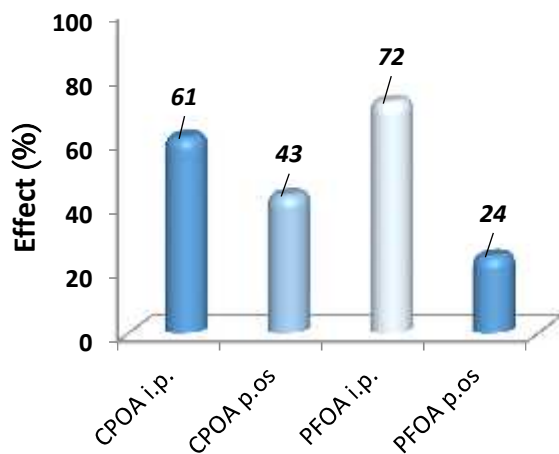


Fig. 1-a. Preventive effects of CPOA and PFOA in ethanol induced GU model in mice

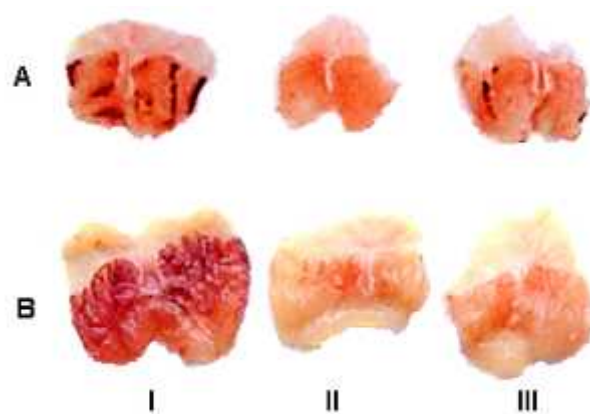


Fig. 1-b. A –oral, B – intraperitoneal administration

I-control; II - CPOA III –PFOA (100mg/kg).

The finding of present study demonstrated that either oral or intraperitoneal administration of both CPOA and PFOA protected gastric mucosa from damage induced by absolute ethanol (Fig 1.a). It is remarkable that PFOA produced a greater protection when it was administered intraperitoneally, whereas CPOA appeared more effective when used orally (Fig 1.b). It is likelihood that ulcer preventive efficacy of CPOA and PFOA may be attributed to their known antioxidant properties, though further experiments are needed to define their precise mechanism of action.

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P50. Orjonikidze M., Tabatadze N., Getia M., Tsagareishvili G., Dekanosidze G.

A spectrophotometric method of quantitative analysis of phenol-carbonic acids in "Epicef"

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Pellets of an anticonvulsive medication "Epicef" were developed from the roots of *C. gigantea* at the TSSU I. Kutateladze Institute of Pharmacochemistry. A spectrophotometric method of quantitative analysis for the standardization of these pellets was developed.

Identification of the active compounds of the pellets was performed by HPLC.

The method conditions were the following: mobile phase – Water (0,1% HCOOH) – Acetonitrile (0,1% HCOOH), gradient mode, analysis time – 25 min, column – C18 reversed phase Kinetex XB-Rp18, 250×4.6mm (Phenomenex). UV-detection was performed at 254, 280, 325 and 365 nm.

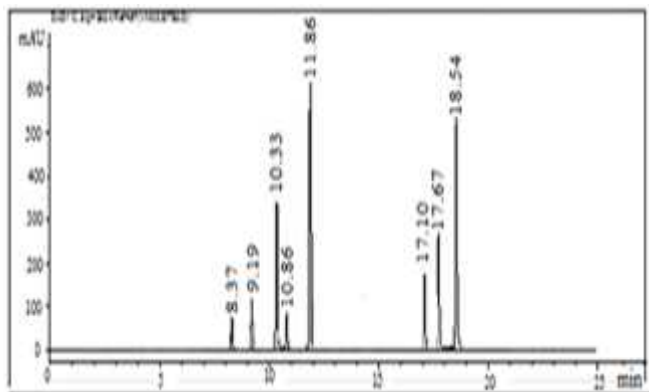


Fig.1. HPLC analysis of *C. gigantea* extract (280 nm). Chlorogenic acid (r. t. 10.33 min), caffeic acid (r. t. 11.86 min) and quercitrin (r. t. 17.67 min).

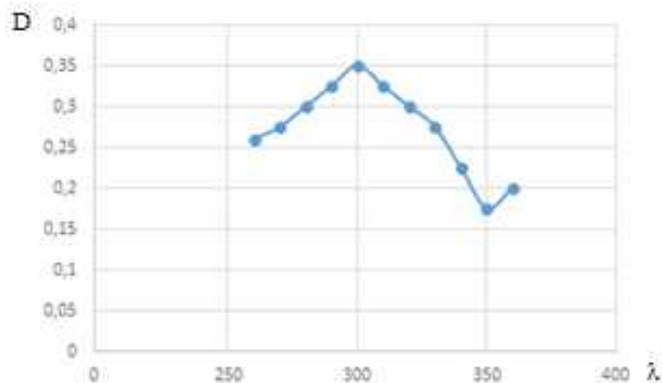


Fig.2 Correlation between absorbance and wavelength of the active extract of *C.gigantea*

The following phenolic substances were identified: chlorogenic acid, caffeic acid and a glycoside – quercitrine. Bas on this data the standardization of the pellets of "Epicef" was carried out based on phenol-carbonic acids. The UV absorption spectrum of a 0.4% aqueous solution of the "Epicef" pellets was studied. The absorption maximum was at 300 ± 5 nm. The excipients had no effect on the absorption maximum.

According to the developed method a 30% ethanolic solution of the dry extract was analyzed directly with UV spectrophotometry at 325 nm in a 10 mm cuvette. 30% ethanol was used as a blank. The sum of the phenol-carbonic acids was calculated in terms of caffeic acid. The method error is 1.3%. The reproducibility, trueness and linearity of the method were validated.

Thus a method for quantitative UV-spectrophotometric analysis of an anticonvulsive medication "Epicef" was developed based on the content of phenol-carbonic acids.

P51. Pataridze G., Maisuradze M.

Processing of the mass obtained from the common walnut (*Juglans regia*) and hazelnuts (*Corylus*), pumpkin (*Cucurbita*) and melon (*Cucurbita*) seeds, after oil removal.

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Research object: The object of the research is the fruits of nuts and hazelnuts taken from Guria and Samtredia regions and the seeds of melon and pumpkin taken from Kakheti region.

Experimental works were carried out by performing laboratory-chemical analysis. The work presents drying of the mass obtained after removing oil from common nut and hazelnut fruits and pumpkin and melon seeds, technological scheme of the getting and mixing of complex powder from dried raw material;

When taking these complexes, it is necessary to take into account the physiological antagonism between a number of macro and microelements. At the same time, there are cases of positive interaction between individual elements (synergism). There may be some examples of synergism: manganese and zinc, iron and cobalt.

Cell fractionation: For biochemical research in marc cells of pressed hazelnuts, nut, pumpkin and melon, it is important to get organelles in morphologically native and biochemically active way. Cell fractionation consists of two successive stages: homogenization and

separation. At the stage of homogenization, the tissue structure is disturbed and we get so called homogenate. At the second stage of separation individual components of homogenate are grouped based on general physical properties (size, density).

For processing tissues, such as marc of pressed common nuts, hazelnuts, pumpkin and melon I used variable speed device homogenizer-blender.

For removing low-molecular substances from the colloidal and high-molecular solutions from all four samples, I made dialysis.

For separation of cell organelles and biomolecules, I used centrifugation.

P52. Rukhadze T., Kusradze I., Gogoberishvili T.

Microbiology sampling methods in cleaning validation

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Introduction: Non-sterile drugs are wide range of medicinal products at pharmaceutical market and therefore, control of their quality is of utmost importance in present-day pharmaceutical industry. To achieve the quality objective, it is necessary to control all stages of drug manufacturing, which influence the quality of product, from raw materials to packaging of finished products. One of the main stage of quality control of products is assessment of the effectiveness of cleaning procedures implemented at manufacturing facility, in particular, running of Cleaning Validation. Cleaning Validation includes Microbiological control aspects, in particular justification that cleaning procedure available in the manufacturing facility fully ensures free of microorganisms drug-products. To achieve this, validated microbiological sampling methods, with high recovery percent, are necessary. According to this, main aim of our study was to assess of existing microbiological sampling methods, their recovery presents and to determine perspectives of their usage in Cleaning Validation.

Materials and Methods: Standard microbial strains were used for this study, as following: *E. coli* ATCC8739, *Staph. aureus* ATCC6538, *Ps. aeruginosa* ATCC9027, *B. subtilis* ATCC6633, *C. albicans* ATCC10231, *Asp. brasiliensis* ATCC16404. Swabbing and Contact plates were used for sampling and 316 Stainless metal coupon as a surface. Experiments were performed as following: 100cfu/ml microbial suspension was administrated on metal coupon, samples were taken in 1min with contact plates and swabs. For sampling swabs were used in four different ways: 1. sampling by one wet swab, placed in one tube with buffer; 2. sampling by one wet and one dry swab, placed both in one tube with buffer; 3 sampling by one wet and

one dry swab, placed in different tubes with buffer; 4. sampling by one wet and one dry swab, placed both in one swab-vial with buffer. Samples taken with swabs were filtrated and all samples were incubated.

Results: The following results were observed for each tests: Contact Plate Sampling method recovery was determined as 65-88%. Four tests were performed for Swabbing Sampling Method: Test 1- recovery 15-24%; Test 2 - recovery 20-35%; Test 3- recovery 38-50%; Tests 4- recovery 40-60%. Recovery percent were varied for different genera of bacterial strains.

Conclusion: From Microbiological point of view, a method is considered as acceptable if its recovery is more than 50%. It is a common knowledge that method of contact plates is more sensitive than swabbing method and its efficiency is often higher than 60-70%, which was ones more proved in our study. As for the swabbing method, it is known that recovery percent for this sampling method is about 20%, however, by using two swabs and special swab-vials for sampling, we managed to increase recovery of swabbing method from 20% to 40-60%. These results gives us opportunities to use Swabbing Sampling Method in Cleaning Validation, when Contact Plate Sampling Method can not be used due to rough surfaces of critical points.

P53. Sagareishvili T., Alania M.

Endemic species of Caucasus – *Salvia garedji* – the rich source of biologically active compounds

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The chemical investigation of *Salvia garedji* (family Labiatae) distributed in *eastern* part of Georgia has been carried out. Based on the phytochemical analysis of aerial parts of plant was established that they are rich in phenolic compounds. Di- and triterpene compounds are biosynthesized as well in plant. Hydrocarbons, stereoisomeric forms of triterpenoids, flavonoids, phenolcarboxylic acids and condensed tannins were isolated and identified. Some individual compounds and substances showed antiviral, anti-inflammatory and antioxidant activities.

P54. Salahova S.Z., Topchiyeva Sh.A., Alakbarov I.Kh.,

Zooplankton as Indicator of Technogenic Pollution of the Caspian Sea

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The goal of the research is a comprehensive study of the zooplankton community as an indicator of anthropogenic pollution of the Caspian Sea. Observations were conducted seasonally at the oil and gas fields from different points of the Azerbaijan coast.

All the studies were carried out at the Complex Research Laboratory of Ecological Department, SOCAR and at the Institute of Zoology of NASA

Research results of the background levels of heavy metals concentrations have established that the main toxicants polluting the waters of the Caspian basin are zinc and copper, their concentrations exceed the concentration of fishery MPC.

Due to the decreasing of the pollution of the Caspian Sea, the biomass of both phytoplankton and zooplankton was increased.

Material collection for the study of the species composition and biomass of zooplankton was conducted by us from 2011 to 2014 on the research vessel «MRK 452», «M. Suleimanov» and on the vessel «ADVENTURE» Ecological Department of SOCAR. The observations made seasonally on oil and gas fields from different points of the Azerbaijani coast of the Caspian Sea, which differ the degrees of pollution. Overall for all chemical analysis has been subjected more than 307 samples of seawater. All researches carried out at the Complex Research Laboratory of Ecological Department of SOCAR and at the Zoology Institute of the Azerbaijan National Academy of Sciences.

During the research for the 2011 - 2013 on ten different stations of the Caspian Sea zooplankton was represented by 45 species of ciliates, 20 species of rotifers and crustaceans were represented by 26 species, 13 species from them were Copepoda, 12 species were Cladocera and 1 species of Ctenophora. The minimum species diversity was observed in winter (9 species), the maximum - in fall (12 species).

Established that the highest concentrations of heavy metals Fe, Ni, Zn, Cu, Pb, As, Cd identified in seawater in 2013 on the oil and gas fields «Oil Rocks», «Gyarbi Absheron», «Banka Absheron», «Bulla Deniz» of the Azerbaijani sector of the Caspian Sea.

The biochemical studies on the territory of contract areas of oil and gas fields «Guneshli» and «Bulla Deniz» of the Caspian Sea revealed high rates of organic carbon in December – 10,51% and the lowest in September – 2,97%; organic matter reached a maximum in autumn (5,1%), and the minimum value in winter (0,84%).

For the first time as a result of research were studied species composition, seasonal dynamics and population's structure of the main zooplankton groups depending on the degree of environmental pollution by heavy metals, oil products and biogenic elements in different parts of the Azerbaijani sector of the Caspian Sea. For the first time revealed the indicator possibilities of planktonic ciliates, rotifers and crustaceans (Copepoda and Cladocera) and their role in the ecosystem.

For the first time, were revealed the indicator capabilities of planktonic ciliates, rotifers and

crustaceans (Copepoda and Cladocera) and their role in the ecosystem. The results of the research make it possible to recommend planktonic ciliates, rotifers and crustaceans (Copepoda and Cladocera) as bioindicators of the degree of environmental pollution by technogenous emissions from industrial enterprises.

The results of research allow us to recommend the planktonic ciliates, rotifers and crustaceans (Copepoda and Cladocera) as bioindicators of environmental pollution technogenic emissions of the industrial enterprises.

P55. Sivsvadze K.¹, Tushurashvili P.², Bokuchava N¹.

Development and Validation of LC-MS/MS Method for Simultaneous Determination of Atypical Antipsychotic Agents in Human Blood

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In recent years, using of second generation (atypical) antipsychotic drugs for both medical and non-medical purposes have been sharply increased. In forensic toxicology, antipsychotic drugs are considerable interest because of their toxical effect and abuse potential. Consequently, in the scope of this work was developed validated a selective, reproducible and sensitive Liquid Chromatography – Tandem Mass Spectrometry (LC-MS/MS) method for determination of atypical antipsychotics – olanzapine (OLZ), risperidone (RIS), quetiapine (QUE) and clozapine (CLZ) in human blood. For isolation was used solid phase extraction with the Gilson GX-271 ASPEC solid phase extraction system, cartridge Supelclean LC-18 SPE 500mg. For elution was used freshly prepared mixture containing methylen chloride - isopropil alcohole - ammonium hydroxide (78:20:2).

Analysis was performed on AGILENT TECHNOLOGIES 1290 Infinity AGILENT TECHNOLOGIES 6460 Triple quad LC-MS/MS system. Separation was performed by gradient elution on Zorbax Eclipse plus C18 (100×2.1 mm, 1.8 μm) column, equipped with pre-column: UHPLC GUARD Zorbax Eclipse plus C18 (5×2.1 mm, 1.8 μm); column temperature was 40°C. The mobile phases consisting of 0.1 % water solution of formic acid HCOOH (H₂O):0.1 % acetonitrile solution of formic acid HCOOH (CH₃CN). The flow rate was 0.45 mL/min.

Determination was performed on triple-quadrupole massspectrometer employing electro spray ionization technique (ESI⁺) operating in multiple reaction monitoring (MRM) and positive ion mode. Total chromatographic run time 10 minute.

The optimal MRM transitions for OLZ were m/z 313 → 198, m/z 313 → 213, m/z 313 → 256; for RIS were m/z 411 → 110, m/z 411 → 163, m/z 411 → 191; for QUE were m/z 384 → 208,

m/z 384→236, m/z 384→253, m/z 384→279; for CLZ were m/z 327→192, m/z 327→243, m/z 327→256.

Method was validated on following parameters: Specificity, Linearity, LOQ, LOD, Accuracy and Precision, Recovery, matrix effect and stability.

The method was subsequently applied for simultaneous determination of four atypical antipsychotic agent olanzapine, risperidone, quetiapine and clozapine in blood samples. The received data gives the opportunity of forensic investigation of the intoxication or postmortem cases.

P56. Targamadze L., Gelovani N., Gvelesiani I., Tsomaia I., Ghughunishvili-Songulashvili D.
Pre-processing of raw material (quinces, cherries, elder) for getting vitamin and enzymatic complexes

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The purpose and objectives of the research: To obtain vitamin and enzymatic complexes from vegetable and animal origin raw material, technological means of processing plant raw material and modern, improved methods are needed. Simplicity and accessibility of selected methods.

Research methodology

- 1) To obtain vitamin and enzymatic complexes, we selected plant raw material containing biologically active substances and made their characterization.
- 2) We conducted pharmacognostic research on all plants that are in the composition of multi-component plant collection. Determined their assessment criteria; Preliminary experiments of biologically active substance content in the leaves of cherry (*Cerasus vulgaris* Mill.) and elderberry *Sambucus ebulus* L, we selected extracting reagents of biologically active substances.
- 3) We carried out the experiments on composition of biologically active substances in the fruits and leaves of quince (*Cydonia oblonga*) and elder (*Plores Sambaci nigrae*);
- 4) We developed methods for determining biologically active substance properties and identified the norms of content in the selected plants according to regions of Georgia;
- 5) We studied the effect of extraction on way out of biologically active substances from plant collection, in order to work out the scheme of getting dry extracts from existing raw material and determine the quality indicators;

6) Particular attention is paid to the selection of technological processes of fruit drying;

The results and conclusions: As it is confirmed the way we will maintain vitamins, will not lose useful properties of the product, even more- will add them – is the fruit drying. Thanks to this method, fruit will become a concentrate of vitamins. Moderate use of dried fruit – no more than 100 g /day – does not cause the increase of blood sugar and weight.

Along with vitamins, all micro and macro elements of these species are retained in dried fruit.

P57. Tetemadze N.; Matchutadze I.

Species of sphagnum as bio indicators of atmospheric air pollution

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Aim. According to the statistics, during last ten years is increased fumes from disordered cars, also number of construction, that is why we have high indicator of air pollution in Adjara Black Sea city Batumi.

Methodology. Species of sphagnum, that participated in Kolkheti peat accumulation is distinguished with high sensitivity towards pollution of atmospheric air. Pollution of atmospheric air became reason of *Sphagnum austinii* disappearing in Europe. For this reason, on four seasons of Batumi, on the areas overloaded by traffic (D.Agmashenebeli St, Gorgiladze St, Tamar Mephe Highway and Gogoli St) were installed so called “bags of sphagnum”, in order to define level of polluted air. For the research was prepared “moss’s bag” with the usage of *Sphagnum palustre*, received results were proceeded by gas chromatography *Agilent Technologies GC/MS 7000 Triple Quad*.

Results and conclusion. While comparison of patterns taken in natural environment with chemical analysis taken from “bags of sphagnum” in the area overloaded by traffic, high difference in number of heavy metals was revealed, this proved, that index of pollution with heavy metals is high in the air polluted by fumes of transport and it is over limited norm. So called “bags of sphagnum” as the cheapest equipments will be installed and established in different cities of Georgia.

P58. Tsertsvadze A., Berashvili D., Ebralidze L., Lagazidze D.

Extraction of humic substances from sphagnum peat peloids: influence of different reagents

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Introduction and research purpose

Peat peloids are formed in a permanent wetland areas, as a result of decay higher plants dead remains in anaerobic area, with the participation of microorganisms. Peat mass absorbs soil and ground water.

Microorganisms play an important role in the process of decomposition and mineralization process of peloids. Peloids are mainly used locally.

Scientific research has shown that the use of mud-application increases body temperature, increases skin electrical conductivity, absorption capacity, activation of hormones and enzymes, increases blood circulation. Peloids, consisting of organic and mineral substances are used to treat many degenerative diseases, their beneficial effects are caused by variety of chemical substances in peloids.

Peloids are predominantly rich with humic substances, which are characterized with high biological activity. Humic acids stimulate enzymatic activity, regenerative processes and have anti-inflammatory activity. Besides humic acids peloids contain: aminoacids, phenol carbon acids, fatty acids, which are formed due to degradation of organic compounds. The main component of humic substances are hummine acid (brown), fluoric acid (yellow) and their salts - Hummets / 1 /.

Humic substances are a complex that have the ability to absorb toxic ions when interacting with them.

One of the most important features is the antioxidative potential indicator, which is very important in terms of reducing the oxidative stress of the body / 4 /.

Their phenolic groups act as an electron donor, preventing the formation of metals, especially iron and copper-free radicals, they have the ability to link free radicals, heavy metals, and form chalet complexes, thus breaking free radicals with lipids oxygen oxidation. These antioxidant properties are also useful for pharmaceutical and cosmetic applications / 2,3 /.

The aim of the research is extraction and characterisation of humic substances from Kolkheti sphagnum peat peloids. During the study modern instrumental methods of physical and chemical analysis were used.

Based on data for extratction of humic substances following extragents were choosed: 1) 0,5N NaOH, 1.0N NaOH, 2.0N NaOH / 2) 0,5N KOH, 1.0N KOH, 2.0N KOH / 3) 0,5 N Na₄P₂O₇, 1.0N Na₄P₂O₇, 2.0N Na₄P₂O₇ / 5 /.

Extraction was held with and without ultra-turax (IKA-ULTRA TURAX-T18/20 000 rpm/min).

Results

Extraction process of humic substances was studied by using different extragents. Based on results optimal extragent and mixing type was choosed. E4/E6 ratios were determined to describe humic substances in research objects.

Conclusions

For the extraction of humic substances from the research objects was determined: type of extragent, mixing type (IKA-ULTRA TURAX-T18) 20 000 rpm/min; type of separation reagent.

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P59. Tsintsadze T.G., Gabelaia M.A., Iavich P.A., Nishnianidze M.V.

The possibility of using Georgia's vegetable and mineral raw materials for the production of therapeutic and prophylactic cosmetic products

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As a result of the study recipes for therapeutic and prophylactic cosmetic products, such as powders (including powders for problematic skin), several variations of cold creams (moisturizing, protective, nourishing), dry elixir for teeth with special purpose, therapeutic and prophylactic toothpaste, were developed and certified in accordance with the ISO standards. In the developed recipes products that can be obtained from vegetable raw materials that grow in Georgia: vegetable oils from grape seeds, walnut, rosa canina; mandarin and lemon essential oils; cornstarch, aloe dry extract and propolis oil extract as well as mineral components – bentonite from Askana and mineral waters "Plate" and "Zvare" can be used.

Comparative analysis of the chemical composition of the Georgian mineral waters "Plate" and "Zvare" and mineral waters used by «Uriage», «Vishi», «Avone», «La Roshe Pose» show that the total composition of the Georgian mineral waters is almost identical to the waters used by named European brands and on the quantitative content of a number of elements even significantly exceeds them. For example, Si - directly participating in the synthesis of collagen fibers (78,571mg/l and 42 mg/l respectively); Fe - one of the minerals that prevents occurrence of anemic symptoms (0,63 mg/l and 0,06mg/l); H₃BO₃ (5,837 mg/l); I(0,63 mg/l); Li(0,45 mg/l) can be found only in Georgian mineral waters. All mentioned components are similar to the components used in cosmeceuticals and can be produced on the territory of Georgia from local vegetable and mineral raw materials. This may bring significant economic benefit.

The given data proves possibility and expediency of development of the corresponding field of industry on the territory of Georgia.

P60. Tskhadadze Sh.^{1,3}, Kupatadze N.², Gaprindashvili R.¹, Tugushi D.², Katsarava R.^{1,2}

Nanosilver Containing Antibacterial Composites Made of Amino Acid Based Biodegradable Polymers

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Introduction: Silver nanoparticles (AgNPs) are new materials that are widely used in biomedicine. Two main features that make AgNPs valuable are their strong antibacterial effect and low toxicity. Especially promising are composite materials made of AgNPs and biodegradable polymeric matrices [1]. Such types of nanocomposites are excellent coatings for surgical devices for preventing biofilm formation- releasing "killers of bacteria" along with the erosive degradation of a matrix ("collapsing foundation") interfere bacteria to occupy the surface ("biofilm shield"). These nanocomposites are also promising as wound dressing materials to treat infected superficial wounds [2]. The goal of the study is to obtain bioerodible antimicrobial coatings containing silver nanoparticles (AgNPs) using cheap source of energy – daylight irradiation.

Method and materials: For creating nanosilver containing bioerodible antibacterial coatings we selected ethanol soluble, biodegradable co-poly (ester amide) (PEA) composed of L-leucine, 1,6-hexanediol and sebacic acid reported in Ref.[3]. AgNPs were fabricated *in situ* by

photochemical reduction of AgNO₃ dissolved in polymer solution in ethanol using daylight-irradiation as an energy source.

Results: AgNPs were fabricated by reducing of silver ions to atomic state by ethanol molecules. Obtained AgNPs were characterized by shape and size using UV-spectroscopy (surface plasmon absorption), transmission electron microscopy (TEM), and laser dynamic light scattering (DLS).

Conclusion: Antibacterial nanocomposites composed of biodegradable polymeric matrix and AgNPs were obtained using a facile and cheap method of photochemical reduction of AgNO₃ in ethanol solution. The obtained biocomposites materials are of interest as both "biofilm shields" and antibacterial wound dressings to treat infected superficial wounds.

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P61. Tsurtsunia I. G., Jurkhadze L.

Development of tonal cream technology

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Research actuality: the skin is one of the most important parts of our body, protecting internal organs, systems and the whole body from the surroundings (UV rays, climate conditions, radiation, numerous bacteria, viral infections, allergic manifestations); the skin reflects inner condition of a person (stress, fatigue, insomnia, unhealthy eating habits, weakened immune system, seasonal allergies); The best way of skin protection is to use decorative cosmetics developed by modern technologies and selected professionally, taking skin type and condition into consideration. From the cosmetic products priority is placed on the creams, due to their consistency, plasticity and thixotropic character. According to above mentioned, the purpose of the research was to develop the formula and technology of a tonal cream, on the basis of plant and mineral resources.

Research results: at the first stage of the research, 5 compositions of tonal creams had been developed considering literature data, activities of biologically active substances of plant and mineral resources. We were preparing emulsion type creams from these compositions, in compliance with general rules of preparation: 1. preparation of water phase, 2. preparation of oil phase, 3. emulsifying, 4. studying the indicators of a good quality.

We have provided biopharmaceutical evaluation of prepared creams with the use of Franz diffusion cells, following spectrophotometer. We evaluated the good quality of the cream with the physical-chemical methods of analysis.

Experimental research has shown that in the same interval, maximal exemption (69,9%) of the biologically active substances (flavonoids) can be achieved in case of using xanthan gum and minimal (22%) maltodextrin as a cream base.

On the basis of biopharmaceutical studies, a tonal cream prescription is provided: maltodextrin -10.0 gr.; Aloe powder -1,0 gr.; Jojoba oil - 10,0 gr.; Peach stone oil - 10.0 gr.; Calendula extract - 12.0 gr.; Red clay -2,5 gr.; Propyleneglycol -10,0 gr.; Twin-60-5.0gr.; Distilled water up to 100 ml.

On the basis of technological studies, the technological scheme of tonal cream preparation has been developed, as well as preparation technology itself. There is drawn up material balance and the technique-economic indicators are calculated;

The supplied tonal cream, with the good quality indicators (uniformity, smell, color, pH, colloidal stability and thermo stability), meets the requirements of decorative cosmetics.

P62. Vachnadze V., Vachnadze N., Kintsurashvili L., Suladze T., Mchedlidze K.

Study of cytotoxic activities of alkaloids from medicinal plants growing in Georgia

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In is discussed a cytotoxic activity of some alkaloid – containing medicinal plants distributed and introduced in Georgia.

Research objects were: *Aconitum orientale* Mill., *A. nasutum* Fish. ex Reichend; *Chelidonium majus* L., *Magnolia Virginiana* L., *M. officinalis* Reher and Wilson; *M. grandiflora* L., *Peganum harmala* L., *Taxus baccata*; *Vinca herbacea* W. et K., and *V. rosea* L. Biologically active substance of alkaloid row were obtained by liquid-liquid extraction method.

The cytotoxic activity of alkaloids was assessed using the resazurin reduction test. Cytotoxicity was evaluated on human lung carcinoma (A-549), human colon adenocarcinoma (DLD-1) and human normal fibroblast (WS-1) cell lines obtained from the American Type Culture Collection (ATCC). Cytotoxic activity of total alkaloids was expressed at the concentration inhibits cell growth by 50% (IC₅₀). Etoposid was used as positive control.

In vitro cytotoxic activity of alkaloids have shown: the pure alkaloid (+)helidonine have shown strong cytotoxic activity against A-549 (0,9±0,1); DLD-1(1,1±0,2); WS-1(1,4±0,6). Cytotoxic activity of total alkaloids *Vinca rosea* L. (roots) have shown against A-549 (3,7±0,2); DLD-1(3,8±0,4); WS-1(11,2±2); of total alkaloids *Magnolia virginiana* L. (bark and leaf) have

shown against DLD-1($6,6\pm 0,2$); WS-1($7,2\pm 0,9$) ; *Taxus boccata* L. (needles) have shown against A-549 ($18,5\pm 0$); WS-1(>200).

The results showed that the others alkaloids have shown moderate activity against all cell lines.

Microstructural investigation of these alkaloid containing medicinal plants have revealed some diagnostic properties, among which can be distinguished the principal structural elements such are: epidermal complex of flaws, leaves structure type itself and architectural texture composition of transitioned systems of over- and underground vegetative plant organs.

P63. Varshanidze N., Turmanidze N., Zarnadze N., Tchitanava J., Diasamidze I.

Biochemistry, reproduction and phytochemical content of *Kalanchoe pinnata* in greenhouse conditions.

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Introduction and goal of research: *Kalanchoe pinnata* belongs to a family of crassulaceae, which is a seasonal, evergreen herb. In folk medicine, new plant breeds are obtained by juice, which is used as an anti-inflammatory and anti-inflammatory method. The aim of the study was to study population in the village of Khobi, the bioecology of *Kalanchoe pinnata* in the conditions of greenhouses placed in Akhalsopeli, the peculiarities of the propagation and the phytochemical content.

Methodology: The phenomenal observation was with help of Shennikov method. We studied the chamber of the research type in the Botany Lab of the Batumi Shota Rustaveli State University and the Laboratory of Biochemistry.

Results: Khobi region village Akhalsopeli, in normal conditions for normal growth and development of *Kalanchoe pinnata* in the conditions of greenhouses placed in winter, the average temperature varies 18-28°C. The vegetative reproduction is possible in the leaves of the leaf, with buds, bulging or leaf plate. It is economically profitable to reproduce leaf plate, for which leaves the plant leaves the layer of the substrate along the edge of the soil and the edges of the substrate. This can be obtained from 7-8 seedlings from one leaf. In this period the soil temperature should be 22-25°C. The juice of *Kalanchoe pinnata* contains catechins containing 0,032%, 40% polysaccharides, and flavonoids with P-vitamin activity up to 8%.

Conclusion: In the conditions of the greenhouse, economically profitable method of propagation of *Kalanchoe pinnata* is a reproduction of leaf cuttings. The juice of *Kalanchoe*

pinnata contains catechins containing 0,032%, 40% polysaccharides, and flavonoids with P-vitamin activity up to 8%.

P64. Zarkua.T, Tsurtsunia I., Nemsitsveridze N., Dugashvili N., Tchumburidze.T
Interactive Lecture in Process of Teaching Profile Disciplines of Pharmacy
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In compliance with the latest requirements, realization of competent approach shall stipulate intensive use of active and interactive forms of trainings in process of teaching.

The weakest part of a traditional form of a lecture is the passiveness of listeners amid high and unilateral activity of a pedagogue. This factor has lately caused the need to introduce new types of delivering the teaching material aimed at increasing listeners' attention and engagement during the lectures.

Interactive lecture – this is the form of teaching, when the delivery of teaching material is conducted with intensive communication and exchange of information among teacher and listeners.

When preparing for a lecture, the lecturer works out some slides in Power Point or Office programs, to which video information with the elements of animation shall be enclosed. The comments by the lecturer along with presenting the video material and animation fragments significantly intensifies the focus of the students on teaching material and increases their interest towards a new theme. The process of teaching becomes emotional, causes the satisfaction of students and grows the quality of the information provided by the pedagogue. Forteaching a theme, the pedagogue may use various interactive methods, like presentations, round tables, interviews, discussions, quizzes, tests and etc.

The interactive teaching gives a lecturer an opportunity to get quick feedback from the students and make instant assessment of how they have understood the new material. If the inquiry shows positive result, then the teacher can move forwards and keep on doing its work, otherwise, the theme shall be worked out again, but with different timelines and by using other visualizations.

The factors mentioned above prove that interactive lectures enable a pedagogue to control the focus of students' attention on audience work and help them better remember received information.