

**INTER-EPIDEMIC PERIOD IN WEST EURASIA:
ARE MAJOR FMD EPIDEMIC
PREDICTABLE?**

The CLOSED SESSION of the STANDING TECHNICAL COMMITTEE of the EUFMD, 29th
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Conclusion

- Countries in the West EurAsia Regions are endemic, some intermediate sporadic by FMD.
- The region has been experienced highly effective epidemic situation periodically.
- It is essential that FMD epidemic could be predicted before the occurrence in order to put into force control measures.
- It is possible by monitoring and analysing of following indicators:
 - Molecular epidemiological (nucleotid sequencing analysis) data,
 - Meat price and animal trading/movement patterns
 - R values as indicator of vaccine sufficiency
 - Serosurveillance results- NSP positivity rate and PI/PV antibody levels

Conclusion(2)

- All the indicators are highly valuable tools to predict the epidemic situation.
- However, some of them is not practical and able to gain the information in time.
- Serosurveillance results is one of the most important data showing the risk; but not supply the warning early enough. However, analyzing cross-border differences of positive ratio can help to understand coming the risk.
- Tracing duration of PI antibody is a good signal for prediction. Because, the changing the generation and fading away PI antibody in a period are generally resulted high risk for a new epidemic.
- PV antibody level, particularly differences young population from the older can provide a meaningful information
- R value is another important signal, but not all time supply us prediction value (like 2007 Turkey O PanAsia II epidemic). And also indication is most likely take place lately the event.

Conclusion(3)

- Animal movement and trading has high risk on the a new virus incursion. Since meat price changing cross-border countries is highly effective on the movement and trade pattern, it should be monitored together with movement and trade pattern in order to asses upcoming the epidemic risk. These tools are practical, easy and valuable to predict the FMD epidemic.
- Molecular epidemiological analysis data is the most important method for prediction. The method can supply us crucial information on the early warning. However, the method should covered systematically all countries into the region in order to supply us timely meaningful information. Current system is not enough for achievement this goal.
- It is concluded that it is possible to predict the major FMD epidemic before the spread using mainly molecular methods, epidemiological investigation and monitoring meat prices/animal movement helping the others indicators.

Introduction



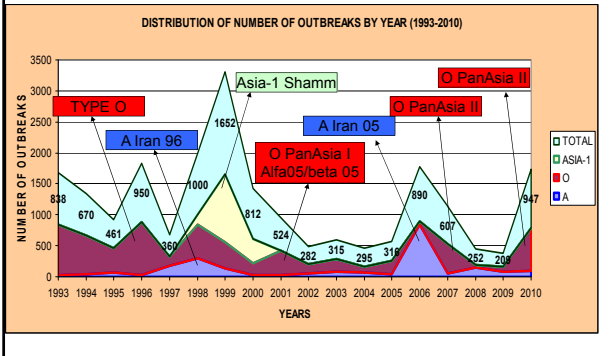
- The West EurAsia Region has almost the same unique condition regarding to disease spread dynamics and take place in the virus pool 3.
- Countries in the regions are endemic, some intermediate sporadic by FMD.
- The region has been experienced highly effective epidemic situation periodically.
- The common border areas are extremely important for maintaining FMD.
- No exact data whether FMD persists mainly independantly in each country or continual transborder movement. However, observation and latest molecular analysis suport the second one is more important for maintaining of the disease
- Highly vaccination coverage achieved, but important gaps remain; biosecurity, quarantine...
- FMD risk related to young animal and lack of effective early and booster vaccination,

**FMD EPIDEMICS PROGRESS
INTERVALY?**

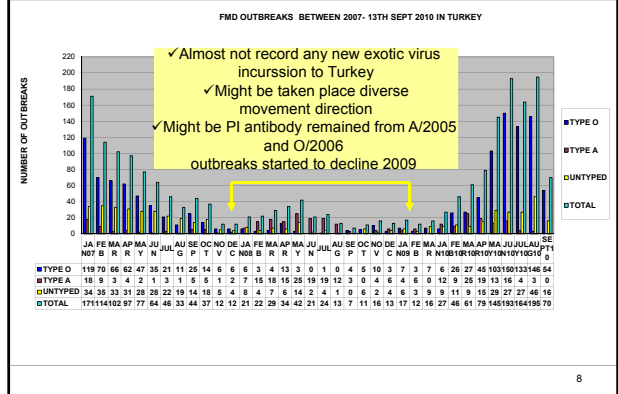
When it is analysed the progress of the FMD in Turkey:

- Although the disease has persisted all time due to the different serotype of FMDV, some lineages cause the major epidemic periodically (mainly 5 years interval).
- Why the disease declines in this interval?
- It might be probable that;
 - PI antibody remained from the previous major aoutbreak can repress the circulated virus
 - No new virus incursion
 - PV antibody level is sufficient to immune the population
 - Means by a good control measures, virus sirculation can be stopped in the place in which it detected as earlier as possible and no further transmission to another place.
- Period of 2008-2009 in Turkey is a good example of this scenerio.
- This rewiev tries to explain possibility of prediction of the major FMD epidemic using mainly this Turkish progressive disease data and also sometimes the others in the region.

Progressive Major Epidemic In Turkey



Disease Situation



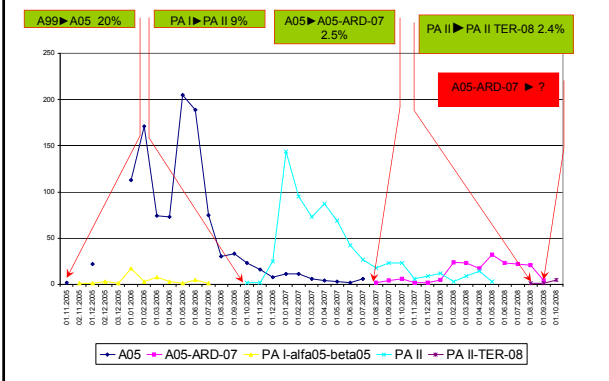
Factors affecting occurrence

- Host population (built up of susceptible population)
 - Immunity (vaccination, booster vaccination, field immunity)
 - age, breed, constitution
 - ...
- FMD virus
 - Antigenic drift induced by mass vaccination
 - Antigenic variation (molecular techniques)
 - New introductions
 - Amount of introductions
 - ...
- Environment
 - Trade, movements
 - control measures, biosecurity
 - Climatic, weather
 - ...

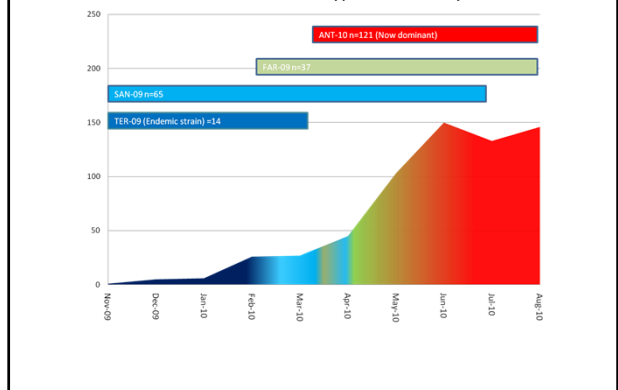
Molecular Epidemiological Analysis for Prediction of FMD Epidemic

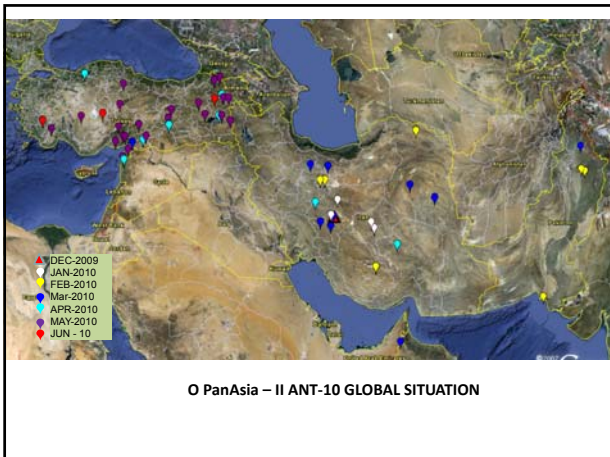
- Genetic change of FMDV can be easily developed inherently.
- During the epidemic period, clade/genotyping transitions can be formed and resulted as genotyping diversity.
- Although some of lose the their virulence in a short period, the others can be persist dominantly in the population.
- The persistent clade/genotype of the virus causes a severe epidemic in population, when introduced.
- However, this virus also can lose its virulence, when accomplish its the evolution. But it can be stillstand the risk for another population.
- Major FMD epidemic can be predicted succesfully by performing genetic analysis used molecular technics in order to follow the cycle of the virus evolution.
- Although this analysis has been carried out partly in the region, it is not enough to fully prediction.
- It should be done as possible as in time and in place in the region

Clade&genotype transitions and VP1 diversity in the last 3 years



Recent events in FMD type O in Turkey





Importance of early detection of entrance new exotic viruses!

Detected first time by Sep Institute on 19th March 2010
ISLAH-IYE, ANTEP

Detected by Pirbright on June 2010 lately

Index case found as November 2009

- Risk for entrance exotic virus is very high any time, depend on occurrence animal movement.
- It is not possible to estimate as possible earlier, unless sample sent to WRL in time or carried out the molecular analysis in place.
- To eliminate this high risk in current situation, it needs to implement proper and sufficient control measures in order to stop the virus circulation in first detected place.

Monitoring the Meat Price

Early 2009

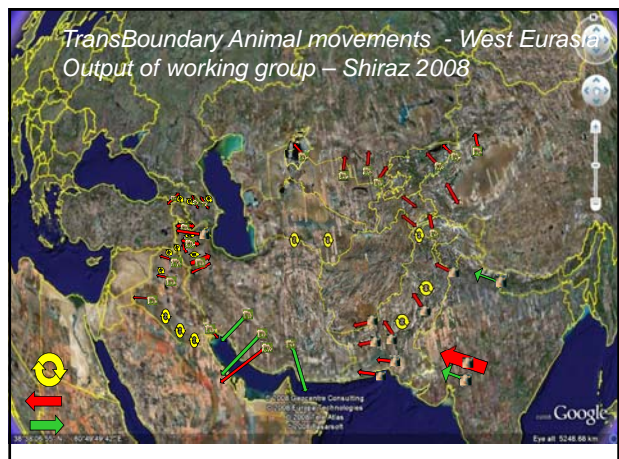
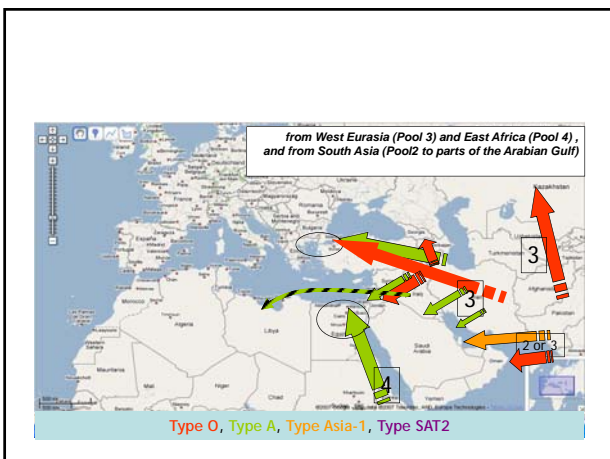
| Country | Cattle/beef | | Sheep | | | | Pigs/pork | | | | | |
|------------|-------------|---------|---------|---------|-----------|---------|-----------|---------|-----------|---------|---------|---------|
| | districts | | capitol | | districts | | capitol | | districts | | capitol | |
| | live | meat | live | meat | live | meat | live | meat | live | meat | live | meat |
| Turkey | 3.7 | 6.2 | 5.9 | 6.5 | 3.7-4 | 8.1 | 4.0-4.4 | 6.7-10 | n.a. | n.a. | n.a. | n.a. |
| Iran | 2.3-3.3 | 7 | 3.9-4.3 | 9 | 3.2-4.2 | 7 | 3.9-4.9 | 9.5 | n.a. | n.a. | n.a. | n.a. |
| Georgia | 1.5-2 | 4.3-5 | n.a. | 5.6-5 | 3.3-7 | 5.5-6 | 3.7-4.3 | 6.9 | 5 | 6.7-3 | n.a. | 6.5-7.3 |
| Armenia | 1.6-2.5 | 3.9-4.4 | n.a. | 4.1-4.7 | 2.4-3.7 | 4.9-6.8 | n.a. | 5.9-6.8 | 2.9-3.5 | 5.4-7.1 | n.a. | 6.6-8.2 |
| Azerbaijan | 4.4-5 | 4.2-7.2 | 5.5-5 | 8.9 | 5.5-6.5 | 8.9 | 6-7 | 10-11 | n.a. | n.a. | n.a. | n.a. |

Mid 2010

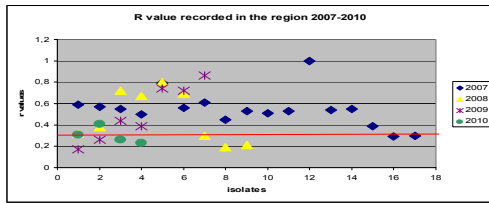
| Country | Cattle/beef | | Sheep | | | | Pigs/pork | | | | | |
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| | districts | | capitol | | districts | | capitol | | districts | | capitol | |
| | live | meat | live | meat | live | meat | live | meat | live | meat | live | meat |
| Turkey | 6.7 | 10.5 | 7.5 | 11.5 | 6.9 | 12.5 | 7.5 | 13.7 | n.a. | n.a. | n.a. | n.a. |
| Iran | | | | | | | | | n.a. | n.a. | n.a. | n.a. |
| Georgia | 2.0-2.2 | 4.3-5.0 | n.a. | 4.3-6.5 | 3.5-4.3 | 5.0-5.5 | 4.0-4.5 | 6.0-6.5 | 2.2-2.9 | 4.3-4.9 | n.a. | 4.3-6.5 |
| Armenia | 2.7-3.5 | 5.4-5.9 | n.a. | 5.3-5.9 | 3.3-4.3 | 6.8-8.1 | n.a. | 7.3-8.2 | 2.9-3.1 | 5.4-6.7 | n.a. | 5.9-7.1 |
| Azerbaijan | 4.5-5 | 6.5-7.5 | 5.5-6 | 9-10 | 5.5-6.5 | 8-9 | 6.5-7 | 10-11.5 | n.a. | n.a. | n.a. | n.a. |

Monitoring the Animal Movement and Trade Pattern

- Movement direction can be possible cross-border in the region which is highly depend on change of the meat price.
- A traditional movement direction is so common, from the east to the west.
- Epidemiological study(2007) about animal movement effect on the dynamics of the spread suggest that almost 70% of the disease spread was related to animal movement
- Monitoring of movement and trade pattern together with meat price is essential for early prediction.



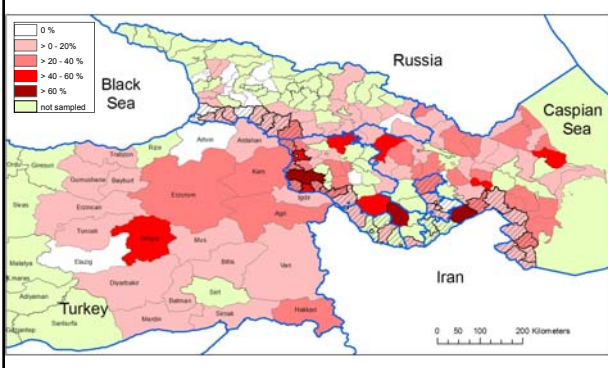
R Values as Indicator to predict the epidemic



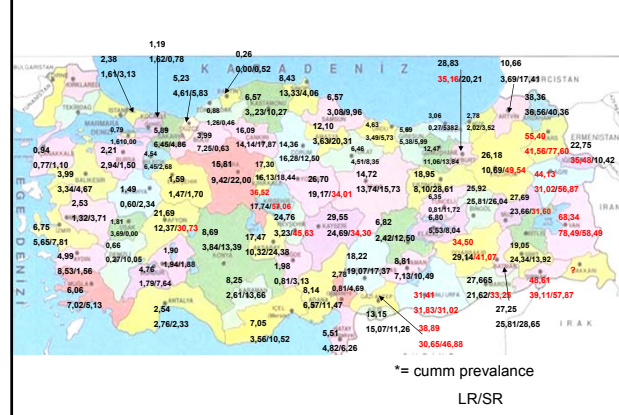
- R values is highly valuable data for assesment vaccine sufficiency.
- However, current available data for the region is not enough to use evidence as proof for prediction of the major epidemic
- It also is not practical always to say in time, mainly data is available lately.

Serosurveillance data

NSP antibody results – regional -



Map Distribution of Estimated Prevalance by Province



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