

TiMOOD™

Study results



Neuronal Protection by TiMOOD™

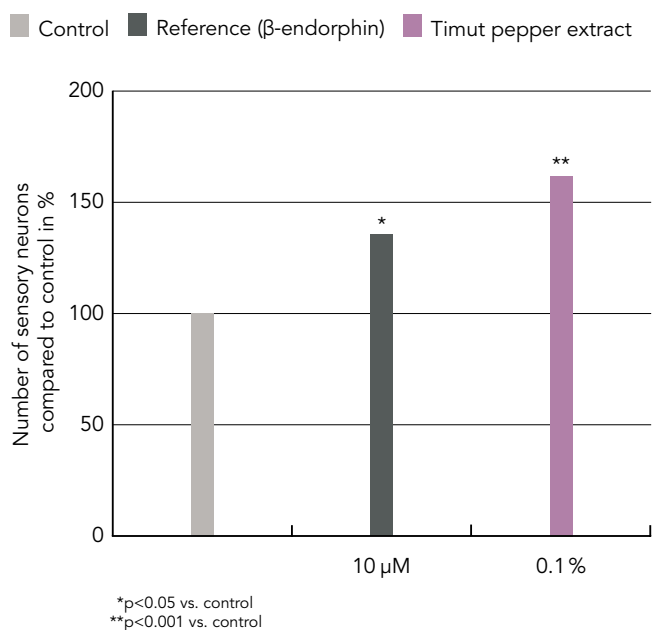
The ability of TiMOOD™ to protect skin innervation was tested in a co-culture model of human sensory neurons and keratinocytes. For this, the cells were treated with 0.1% timut pepper extract or the reference compound β -endorphin at 10 μ M for 9 days during the growth of the model. At the end of the incubation period, the number of neurons and the length of the neurites were assessed and compared to untreated cells.

For this analysis, β -tubulin was stained in the cells to detect the shape of the neurons, whereas the cell nuclei were stained with Hoechst solution. Using photographs taken with a microscope, neurons were counted and neurite length was determined and normalized to the cell number.

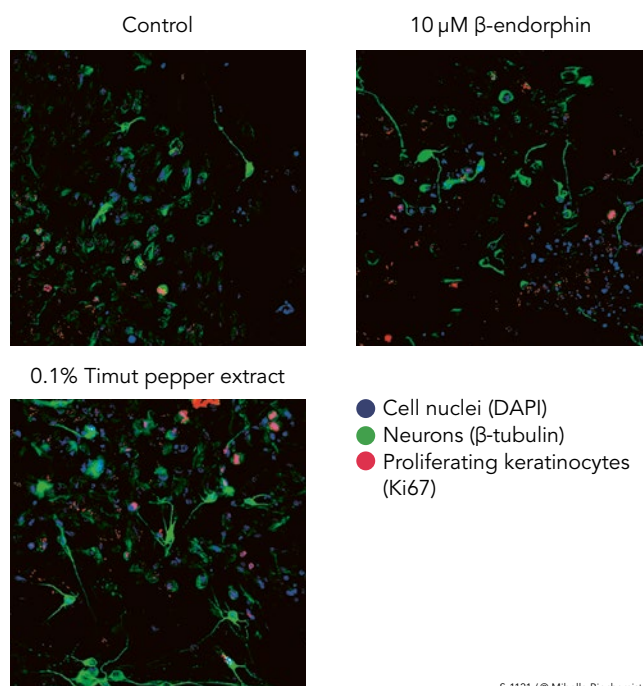
As neurons do not divide, the number of cells and the length of their neurites decreased during the study due to the natural loss of some neurons mimicking an aging process. Treatment with timut pepper extract at 0.1% led to a significantly higher number of sensory neurons (+62%) and increased neurite length (+18%) compared to the untreated control. This effect was comparable to the effect of the reference compound β -endorphin, which is known to positively impact the number of neurons and their neurite length.

Thus, TiMOOD™ can protect neurons from the natural aging process, thereby supporting a proper innervation of the skin.

Timut Pepper Protects Neurons from Aging



Increased Neurite Length



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Enhanced Keratinocyte Proliferation

In the same study of the keratinocyte-neuron co-culture model, the proliferation rate of keratinocytes was determined by staining of the proliferation marker Ki67 and microscopic analysis of Ki67-positive cells. The proliferation of keratinocytes increased significantly, resulting in a proliferation rate that was 108% higher than that of the control.

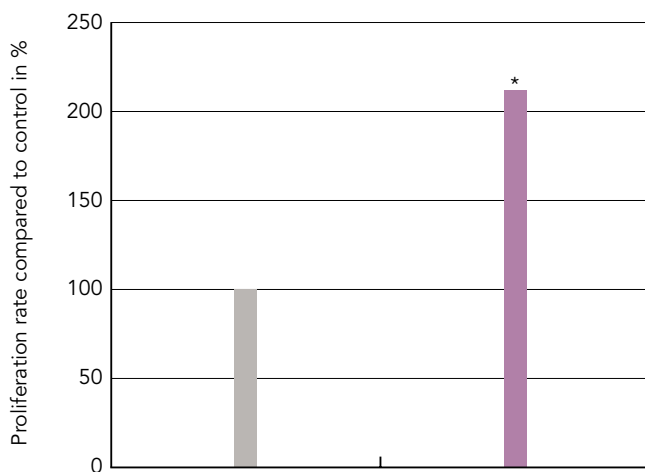
Increased Release of Dopamine

Moreover, in the same study, the release of dopamine was measured by ELISA in the supernatant of the cell culture after 8 days of treatment. Dopamine can be released by keratinocytes and is involved in several important processes of the skin, such as microcirculation and barrier function. The treatment with 0.1% timut pepper extract enhanced dopamine release by 17%.

Thus, by supporting the skin innervation, TiMOOD™ increases the release of dopamine and enhances keratinocyte proliferation. A higher number of keratinocytes, in turn, can enhance the growth of neurites, resulting in functional and healthy skin. Considering the reduced epidermal proliferation in aged skin, TiMOOD™ may also support skin rejuvenation by preventing epidermal thinning.

Enhanced Keratinocyte Proliferation

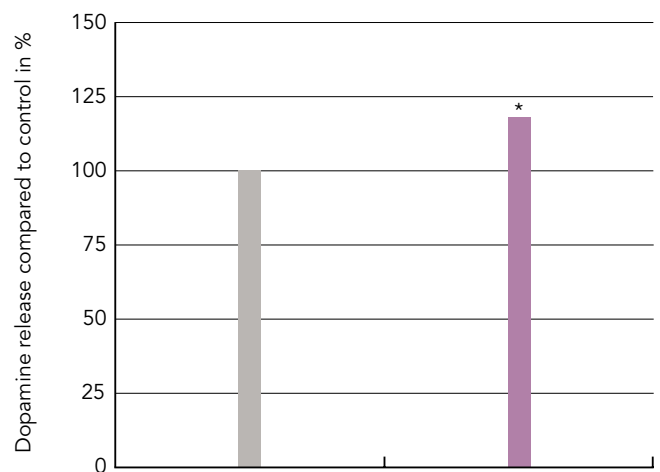
■ Control ■ 0.1% Timut pepper extract



*p<0.001 vs. control

Increased Dopamine Release

■ Control ■ 0.1% Timut pepper extract



*p<0.0001 vs. control



Improved Skin Complexion

To assess the effect of TiMOOD™ on the skin, a placebo-controlled double-blind clinical study on a panel of volunteers feeling stressed and/or uncomfortable in their skin was performed. A total of 43 volunteers aged between 40 and 61 years (mean age: 49.6 years) were split into two groups. One group used a cream containing 2% TiMOOD™ twice daily for 28 days, whereas the other group used a corresponding placebo cream on their face. At the beginning and the end of the study, skin complexion was assessed.

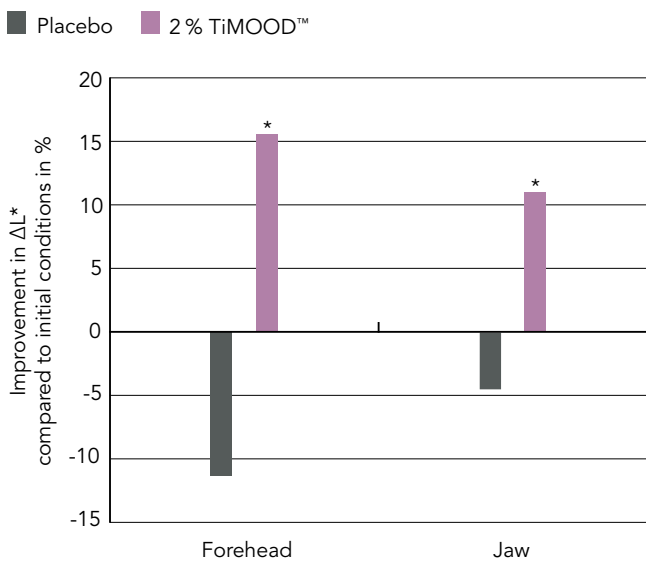
For this, skin tone evenness was measured by a spectrophotometer at 20 different spots on either the jaw or the forehead of each volunteer. For each region, the standard deviation of the L* (lightness) or b* (blue-yellow) values was calculated as a measure of skin tone evenness between the different spots. The treatment with TiMOOD™ resulted in a significant improvement of skin tone evenness compared to initial conditions, whereas it even slightly deteriorated in the placebo group. The standard

deviation of L* values (ΔL^*) decreased by 26.4% on the forehead and by 15.5% on the jaw compared to initial conditions and placebo. A similar effect was observed for the Δb^* value.

The positive effect of TiMOOD™ on skin complexion was confirmed by an expert who performed a grading based on images taken of the face before and after 28 days. The expert grading confirmed an increased evenness of the complexion and skin luminosity, a reduced skin redness, and a fresher and healthier complexion. All parameters improved by 12–21% compared to the placebo.

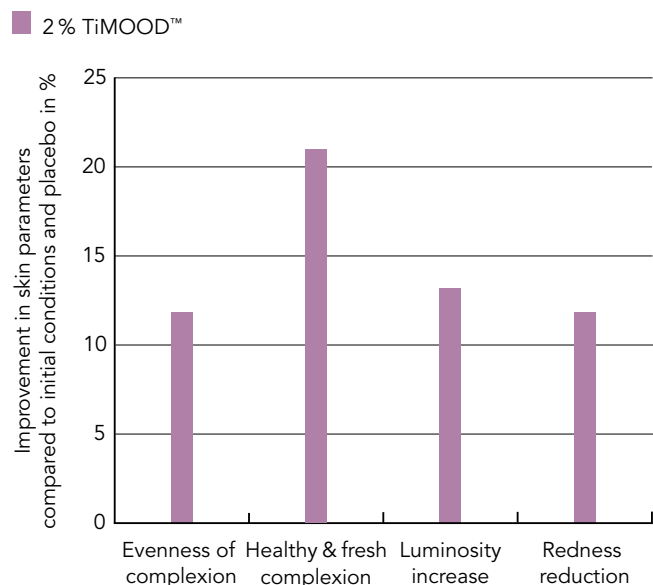
In addition, the volunteers filled in a questionnaire, and 76% of volunteers stated that their skin was more luminous, less dull, and the skin tone was more even after the treatment with TiMOOD™. Furthermore, 76% of volunteers agreed that the product gave the skin a healthier and more radiant appearance.

Increased Skin Tone Evenness



*p<0.05 versus initial conditions

Improved Skin Complexion Parameters



TiMOOD™

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Testing Emotional Wellbeing with an Innovative Neuropsychological Approach

In the same placebo-controlled double-blind clinical study, the volunteers also performed a neuropsychological test (EmoCompass®) to assess their emotional wellbeing. On the first day of the study, the volunteers performed the EmoCompass® test twice, before (pretest) and after (instant posttest) the first application of the cream. In addition, they performed the same test at the end of the study after 28 days of product application (posttest). Only volunteers who did not show extreme emotional changes during the study period (assessed by questionnaire) that may be due to reasons or events unrelated to the study, were included (n=30).

EmoCompass® – Non-verbal Test to Measure Emotions

The EmoCompass® is a market research tool that is used to determine the emotions of consumers based on the principles of neuromarketing. Commonly known neurological and neuropsychological principles such as pattern matching, sensory bridges, and fuzzy logic served as the basis for the development of the instrument. Usually, the results of an EmoCompass® analysis are used as a basis for marketing decisions for fast-moving consumer goods (FMCG). The application in the field of neurocosmetics is a novelty.

For the test, the volunteers were asked the question “How do you feel?”, which they answered non-verbally by generating emotional patterns consisting of coded shapes and colors on a computer screen. The patterns generated in this way represented a personal emotional image of the volunteers and served as a non-verbal answer to the question. This prevents the answers from being distorted by “translating” the emotions into language. In addition, the non-verbal responses are at a low level of association: the patterns and colors are so abstract that – in contrast to working with photos or less abstract visual materials – no personal memories which could influence the responses are associated with them.

The analysis of the emotional patterns results in intensity values (arbitrary units) for the five emotional dimensions:

- D1 – friendly, soft, pleasant
- D2 – inspired, innovative, refreshed
- D3 – powerful, energetic, dynamic
- D4 – safe, relaxed, balanced, calmed
- D5 – excellent, sophisticated, noble

EmoCompass®: Exemplary Emotional Pattern



Improved Emotional Wellbeing by TiMOOD™

The results of the EmoCompass® test showed an improvement in emotional wellbeing in terms of a less stressed and more relaxed state of the volunteers who used the cream with 2% TiMOOD™. Dimension D4, which includes emotions such as safe, relaxed, balanced, and calmed, was markedly increased after the 28-day treatment with TiMOOD™. Overall, the results for dimension D4 were significantly improved compared to the placebo group. The other four dimensions analysed showed no such effect.

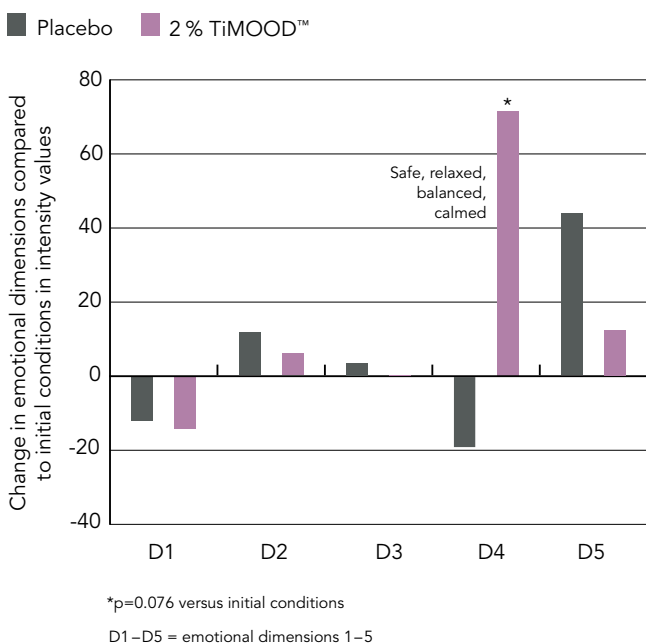
The instant posttest, which took place 5 minutes after the first application did not result in any significant changes in emotional dimensions, confirming that the observed effect was independent of the texture and fragrance of the test product.

Volunteers Felt Less Stressed and More Balanced

Furthermore, in the self-assessment questionnaire, which was filled in by all 43 volunteers, almost double the number of volunteers in the verum group compared to the placebo group confirmed that they were less stressed than they were at the beginning of the study and that they “feel a wave of positive energy coming from within.”

Thus, TiMOOD™ supports emotional wellbeing by helping stressed people to feel more balanced and relaxed.

Increase in Positive Emotions in Stressed People



EmoCompass® Test: Improved Wellbeing with TiMOOD™

