

Körperkonturen straffen und formen Forming and tightening the body silhouette

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Literature References

Beylot C. Vieillissement cutane: aspects cliniques, histologiques et physiopathologiques. *Annales de dermatologie*. 136, 6: 263-9, 2009.

Kavanagh S, Newell J, Hennessy M, et al. Use of a neuromuscular electrical stimulation device for facial muscle toning: a randomized controlled trial. *Journal of Cosmetic Dermatology*, 11, 261-6, 2012.

Jäger S., Handschin C, St.-Pierre J. AMP-activated protein kinase (AMPK) action in skeletal muscle via direct phosphorylation of PGC-1. *PNAS*. 104(29):12017–22, 2007.

Charts & Illustration

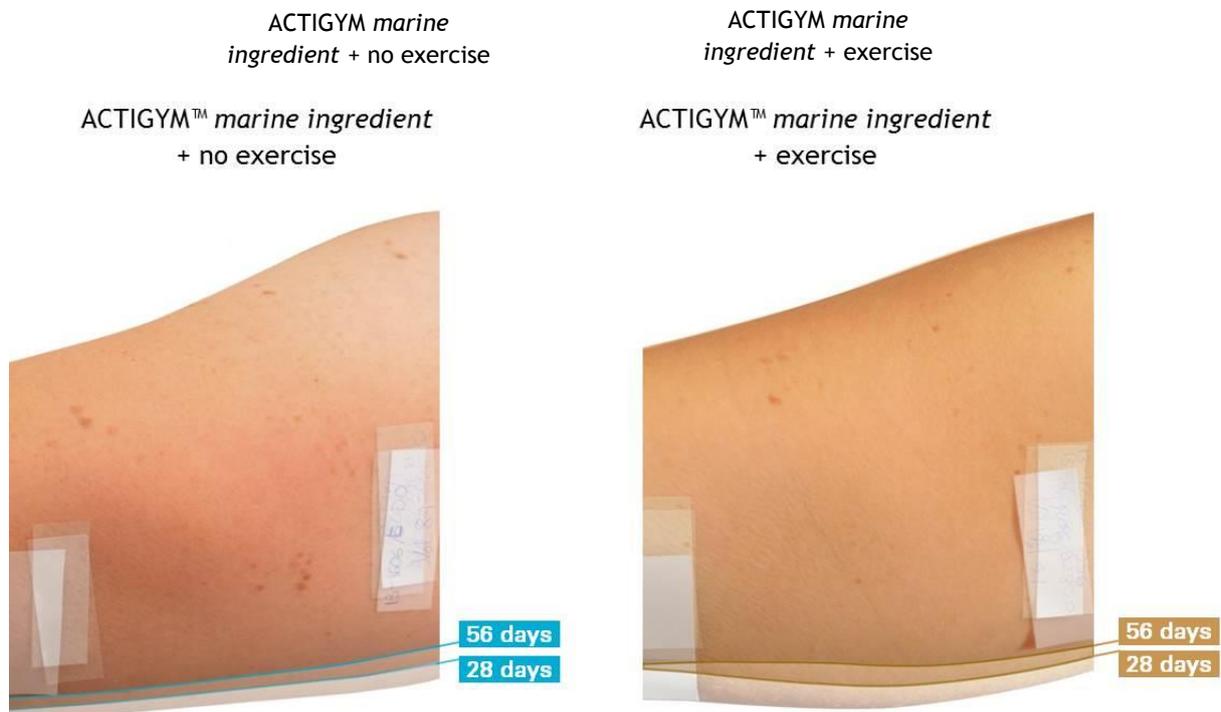


Fig. 3. Superimposed photographs of arms.

Background Information ActiGym

ACTIGYM marine ingredient: A SECRET PERSONAL TRAINER

Mimics the endurance training effect, leading to visible reductions in areas sensitive to sagginess and improvement in the appearance and tone of body silhouette. It can be addressed to a broad range of modern consumer lifestyles, whether sedentary or physically active.

- Contour reductions of -2.8 cm in the abdomen (28 days), -2.1 cm and -1.3 cm in the thighs and arms (56 days), respectively, applying only a cream with 5% actigym™ marine ingredient.
- Even more impressive in vivo results were seen when combining the topical treatment with standardised exercise: -2.4 cm in the arms.
- Diminution of body weight up to -4.8 kg at the end of the treatment.

Actigym marine ingredient has been obtained through biotechnology from a microorganism inhabiting Bermuda and increases the release of adiponectin in adipose tissue, a protein secreted under aerobic training conditions, and enhances mitochondrial activity.

TONING AND SCULPTING BODY SHAPE

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Aging and physical inactivity are associated with a reduced muscle tone and resistance, which can translate into sagginess and worsening of body figure. Inspired by physical training, a new biotechnological ingredient was developed to mimic its benefits on body tone and silhouette definition.

Direct link between inactivity and skin sagginess

The levels of physical activity seem to diminish nowadays and a significant percentage of population has sedentary lifestyles, but it does not mean that the importance of body image has dropped. On the contrary, body shape is still important to self-esteem and confidence today, where external image is so essential.

When aging, silhouette also suffers the effects of changes including the epidermis becoming thinner, reduction of dermal extracellular matrix constituents, metabolism slowdown, redistribution of fat storages and progressive diminution of the muscular quality, implying a minor tone and endurance (1, 2). Muscle tone is understood as the resistance to stretch that muscles have at rest. When muscle tone is adequate, muscles can tightly support the above lying structures and contribute to body firmness. Conversely, sagginess appears especially in the belly, arms and buttocks when body tone relaxes and muscles lengthen (due to gravity for example).

Exercise benefits on muscles and fat storage

The bundles of type I (or slow) muscle fibers are the ones used in endurance training, understood as low intensity efforts for a long period (medium/long distance jogging...). These fibers have a high content of mitochondria, produce slow and prolonged contractions, are resistant to fatigue and use aerobic metabolism as the principal energy source. This metabolism involves the complete oxidation of glucose and fatty acids (FAs) in mitochondria to generate many ATPs, providing a stable and long-lasting energy supply. For this reason, type I fibers help body structures to remain in place.

Endurance exercise increases energy demand, thus lipids are mobilized towards muscles, where FAs are oxidized to obtain energy. This training increases lipid degradation and decreases lipid uptake by adipocytes and the rate of triglyceride synthesis, and can induce the release of signaling molecules like adipokines, that modulate muscle function. Adiponectin is one of these molecules released from adipocytes that not only interacts with muscle fibers to augment glucose uptake and FAs oxidation but also to increase mitochondrial content and enhance aerobic metabolism, leading to more numerous type I fibers that are more toned compared to type II fibers (3).

Imitating aerobic exercise for a toned and attractive body shape

As endurance training improves muscle tone and lowers fat accumulation, Lipotec developed a new ingredient capable of imitating these benefits and improving body figure. Obtained through biotechnology, ACTIGYM™ *marine ingredient* is an extracellular substance produced by a *Bacillus sp.* living in Bermuda that demonstrated its efficacy *in vitro* and *in vivo*, obtaining even better results when combined with physical activity.

In adipocytes, it potentiated the release of adiponectin (by 68.3%) and downregulated the expression of genes linked to fat accumulation (like diacylglycerol transferase 2 by -45.5% or lipoprotein lipase by -22.2%). Besides, when muscle cells were incubated with supernatants from adipocytes treated with such ingredient (higher adiponectin levels), mitochondrial functionality was significantly enhanced (citrate synthase activity by 47.9% and ATP by 136.0%) as well as the myosin marker for type I fibers (by 69.8%).

Its *in vivo* efficacy was evaluated in 60 female volunteers (35-50 years old) with sedentary life styles that were split into three groups. The first group applied a placebo cream twice a day for 56 days and practiced a supervised standardized exercise twice a week, the second group applied an active cream containing 5% of the marine ingredient twice a day without practicing exercise, and the third group applied the same active cream twice a day and completed the training program. The suprailiac skin fold and the contour of the abdomen, arm and thighs were assessed after 28 and 56 days, as well as body weight.

After 56 days, 48% of volunteers reduced the suprailiac fold by an average of -1.8 mm (-19.2%) and 60% of volunteers also practicing exercise reduced -2.0 mm (-21.1%). Abdomen contour was reduced up to -2.8 cm and up to -3.1 cm when combined with exercise after 28 days while, at the end of the treatment, 80% of volunteers reduced it by -1.5 cm.



Fig. 1. Macroscopic pictures of two volunteers at different times.

Regarding thighs, the perimeter was reduced up to -2.1 cm and up to -2.9 cm when it was combined with physical training, and 52% of volunteers reduced an average of -0.9 cm after the 56 days.



Fig. 2. Images of two volunteers before and after the treatments.

At the end of the study, arm contour diminished up to -1.3 cm and up to -2.4 cm when combined with physical activity, and 71% of subjects reduced an average of -0.6 cm.

The marine ingredient also proved to decrease body weight up to -3.1 kg just after 28 days and up to -4.8 kg at the end of the study.

CONCLUSIONS

The natural aging process and the lack of exercise usually lead to increased fat accumulation and reduced body tone, significantly worsening external appearance. Aerobic exercise can help to counteract these effects and improve body figure by toning and defining.

Inspired by endurance exercise and obtained through biotechnology, ACTIGYM™ *marine ingredient* imitates the benefits of this type of physical activity on muscle tone. It diminishes fat accumulation and potentiates adiponectin release in adipocytes, which in turn increases mitochondrial functionality and type I fiber marker in muscle cells. These effects translate into a significant *in vivo* contour reduction (abdomen, thighs and arms) and a visible improvement of body shape, with even better results when combined with training.

This biotechnological ingredient is the ideal topical solution to define silhouette while tonifying muscles, which can be perfectly complemented with aerobic exercise.

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1. Beylot C. Vieillesse cutane: aspects cliniques, histologiques et physiopathologiques. *Annales de dermatologie*. 136, 6: 263-9, 2009.
2. Kavanagh S, Newell J, Hennessy M, et al. Use of a neuromuscular electrical stimulation device for facial muscle toning: a randomized controlled trial. *Journal of Cosmetic Dermatology*, 11, 261-6, 2012.
3. Jägger S., Handschin C, St.-Pierre J. AMP-activated protein kinase (AMPK) action in skeletal muscle via direct phosphorylation of PGC-1. *PNAS*. 104(29):12017–22, 2007.

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