

Matrixyl 3000 **(palmitoyl oligopeptide & palmitoyl-tetrapeptide-7)** **Back to the future of anti-aging skin care**

Matrixyl 3000 is a relatively new skin care ingredient sometimes promoted as a new and improved version of Matrixyl. Both Matrixyl 3000 and "classic" Matrixyl were developed by the [Sederma corporation](#) and are incorporated, usually separately, in a variety of skin care products on the market. The naming suggesting that Matrixyl 3000 is related to Matrixyl might be an attempt to leverage the popularity of the original Matrixyl. In fact, the only relationship between the two is that both are based on peptides and aim at stimulating the synthesis and replenishment of the skin matrix (the skin's structural framework). Their trademark name similarity notwithstanding, Matrixyl 3000 and "classic" Matrixyl are chemically dissimilar except that both are based on peptides (small protein fragments representing short chains of amino acids). Specifically, Matrixyl 3000 is a combination of the two peptides, palmitoyl oligopeptide and palmitoyl tetrapeptide-7, whereas "classic" Matrixyl is a trademark name for the peptide palmitoyl pentapeptide-4. In this article, we review Matrixyl 3000 and its components. For details on the "classic" version, see our article on the original [Matrixyl \(palmitoyl pentapeptide-4\)](#).

Palmitoyl oligopeptide

Palmitoyl oligopeptide (Pal-GHK) is one of the two active ingredients in Matrixyl 3000. It consists of a short chain of three amino acids (a.k.a. GHK peptide or glycine-histidine-lysine) connected to palmitic acid. Palmitic acid is a fatty acid added to improve the peptide's oil solubility and thus skin penetration. The peptide GHK is a fragment of type I collagen molecule and is believed to serve as a biological indicator of increased degradation of the skin matrix. Indeed, when collagen is degraded, more of its small fragments get created in the body, including GHK. Furthermore, GHK is believed to stimulate the feedback loop triggering the synthesis of new collagen as well as other components of the skin matrix. When the key skin matrix-producing cells (fibroblasts) detect increased levels of GHK, they "assume" that the skin matrix is being lost at a higher rate and begin synthesizing it more vigorously. Thus, Pal-GHK (a version of GHK designed for better skin penetration) is intended to stimulate skin matrix replenishment via topical application, leading, presumably, to wrinkle reduction, skin firming and other benefits.

Another interesting point about the GHK is that it is a part of another well known skin care ingredient, the copper peptide Cu-GHK. Copper peptides are known to improve wound healing, activate skin remodeling, improve the structure of skin matrix, reduce scarring and exert other beneficial effects on the skin. The skin benefits of copper peptides are relatively well researched and established (see our article on [copper peptides](#)) In fact, most of the research showing the benefits of copper peptides has been done using Cu-GHK, which consists of the copper atom (in the ionized form) bound to the GHK peptide.

In that light, we can hypothesize that Pal-GHK may act at least partly via the same mechanism as Cu-GHK. At the first glance, this appears unlikely because the benefits of copper peptides are believed to be contingent on their copper component. However, it is possible that the addition of the palmitic acid to the GHK increases its skin concentration so much that even the normally low levels of copper in the skin suffice to activate it. It is also conceivable that many of the effects of Cu-GHK are due to the GHK peptide rather than copper and can be reproduced using a highly penetrating version Pal-GHK alone. Thus, it would be very useful to find out whether Pal-GHK and Cu-GHK indeed work at least partly via the same mechanism and, if so, what are comparative advantages and disadvantages of each. Unfortunately, such research is yet to be conducted.

Palmitoyl tetrapeptide-7

Palmitoyl tetrapeptide-7 (Pal-GQPR) is another active ingredient in Matrixyl 3000. (It was also formerly known and marketed as palmitoyl tetrapeptide-3.) Palmitoyl tetrapeptide-7 consists of a short chain of four amino acids (a.k.a. GQPR peptide or glycine-glutamine-proline-arginine) connected to palmitic acid. Palmitic acid is a fatty acid added to improve the peptide's oil solubility and thus skin penetration.

Palmitoyl tetrapeptide-7 is believed to work by reducing the production of interleukin-6 (IL-6) by the the key skin cells, keratinocytes and fibroblasts. IL-6 is a molecule that promotes inflammation, which, in turn, leads to faster degradation of the skin matrix and thus contributes to the development of wrinkles and loss of skin firmness and elasticity. By reducing the levels of IL-6 and possibly other inflammation mediators, palmitoyl tetrapeptide-7 is thought to slow down the degradation of the skin matrix and may also stimulate its replenishment.

Matrixyl 3000 as a synergistic combination

Matrixyl 3000 combines palmitoyl oligopeptide and palmitoyl tetrapeptide-7 not just because two active ingredients are better than one. According to the Sederma corporation, these two peptides produce a synergy when used together, i.e. the skin benefits of such combination are greater than what one would expect if each agent's effects were independent of each other. Here's a fictitious example of synergy to illustrate my point: Ingredient A causes a 10% improvement and ingredient B causes a 15% percent improvement whereas A+B combo causes a 60% improvement (as opposed to the expected 25% improvement).

According to Sederma, the synergy between palmitoyl oligopeptide and palmitoyl tetrapeptide-7 is dramatic. They reported a tissue culture study where Matrixyl 3000 increased the synthesis of skin matrix roughly 2.5-3.5 times. In particular, the synthesis of collagen type I increased by 258%, fibronectin - by 164% and hyaluronic acid - by 179%.

Sederma also reported a small human study involving two groups of 24 volunteers where Matrixyl 3000 performed considerably better than placebo and somewhat better than "classic" Matrixyl, including the following beneficial effects after two month of daily application^{*}:

- Reduction in main wrinkle depth (-15%) and volume (-18%)
- Reduction in roughness (-14%)
- Reduction in complexity (-16%), "lifting" parameter
- Decrease in the area occupied by deep wrinkles (>200 microns) (-44%), -37% decrease in density
- Increase in skin tone (+15%)

^{*} For details, see complete [report from Sedema Matrixyl 3000 study](#)

Unfortunately, despite plausible theoretical grounds regarding the mechanisms of action of Matrixyl 3000, the not-yet-rational exuberance about it may be premature. Numerous agents holding theoretical promise and/or positive effects in a test tube fail to deliver in properly conducted human clinical studies. As of the time of this writing, there are very few published studies of palmitoyl oligopeptide or palmitoyl tetrapeptide-7 and none of those seem to be independent. Furthermore, the only clinical evidence of the benefits of their combination (i.e. Matrixyl 3000) appears to come from the report by Sedema corporation. This is a far cry from the gold standard, i.e. unbiased, independent clinical studies published in well known peer reviewed biomedical journals. Until such studies are available, the combination of palmitoyl oligopeptide and palmitoyl tetrapeptide-7 (Matrixyl 3000) will remain a promising but unproven treatment.

Best practices, safety and costs

Based on the data reported by Sedema corporation, Matrixyl 3000 appear to produce maximum effect at the concentration around 10-15 ppm (combined for both peptides). However, the data is limited and uncorroborated by other sources and valid only for tissue culture. Therefore, the question about optimal strength of Matrixyl 3000 in skin care formulas remains open. The concentration in the formulas used in Sedema's human study was 3%. In its literature, Sedema recommends the range of concentrations from 3% to 8%. Notably, this percentage is calculated based on the Sedema's proprietary stock solution of Matrixyl 3000 (of undisclosed strength) rather than pure peptides.

Based on the data from Sedema corporation as well as user feedback, Matrixyl 3000 appears to be virtually free of any obvious side effects in short-term use. The effects and side effects of its long-term use are unknown.

There is a large price variation between different products containing Matrixyl 3000, although none are dirt-cheap. However, the price does not always reflect the concentration of the active ingredients. It may reflect prestige of the brand, advertising overhead, sophistication of packaging and so forth. Be wise. Make sure you are paying a fair price per until of the active peptides.

Another cost-cutting alternative is to purchase Matrixyl 3000 stock solution and create your own formula. Matrixyl 3000 appears to combine well with many vehicles and other actives, which makes a DIY option easy to implement. For specific instructions see [DIY Anti-Aging Skin Care Infopack](#).

Bottom line

Matrixyl 3000 is a synergistic combination of two skin active peptides, palmitoyl oligopeptide and palmitoyl-tetrapeptide-7, which appears promising based on both the proposed mechanism of action and preliminary data from the manufacturer (Sedema corporation). However, it remains to be proven effective by independent published clinical studies. Considering its seemingly good safety profile, Matrixyl 3000 may be worth a try even before such studies are available -- for example, if more established agents are ineffective or irritating in your particular case.