



# MSM Skin Health Science Brief

*Oral Application*

---

## Maintaining a Healthy Appearance—Skin Health

No other organ of the body more accurately reflects both our short and long-term habits. Rapid cell production and turnover within the skin means this organ requires an uninterrupted source of nutrients to maintain healthy structure and function. Interruptions to this delicate process manifest as sagging, tired-looking skin or mottled pigmentation (dark spots). Long-term deficiencies of vital skin nutrients can lead to premature aging, a weakening of the extra-cellular matrix (ECM)—the fiber meshwork of collagen and elastin which keeps the skin looking healthy.

While external factors such as direct sunlight can accelerate the formation of wrinkles, the internal environment is where the building blocks of healthy skin must be assembled and put to use. A weakening of the extracellular matrix within the dermis (a breakdown of collagen rich connective tissue) results in thinner skin more susceptible to permanent damage (fine lines and wrinkles). Catalysts (nutrients or other biofactors) that can increase skin membrane permeability, prevent collagen/proteoglycan breakdown and reduce inflammation on and under the surface of the skin can strengthen the ECM and improve the appearance of skin in both the short and long-term.

Methylsulfonylmethane (MSM; dimethyl sulfone; DMSO<sub>2</sub>) has been identified as one of a few select ingredients to effectively improve the appearance of skin by supporting the ECM. MSM is an organic sulfur-containing compound which naturally occurs in various fruits, vegetables, animals, and humans, with the most abundant natural source occurring in cow's milk (Williams, 1966; Pearson 1981). It is an oxidative metabolite product of dimethyl sulfoxide (DMSO) with about 15% of DMSO being converted to MSM. MSM's sulfur content (roughly 34% elemental sulfur) is used by the body to maintain normal connective tissues, including the skin.

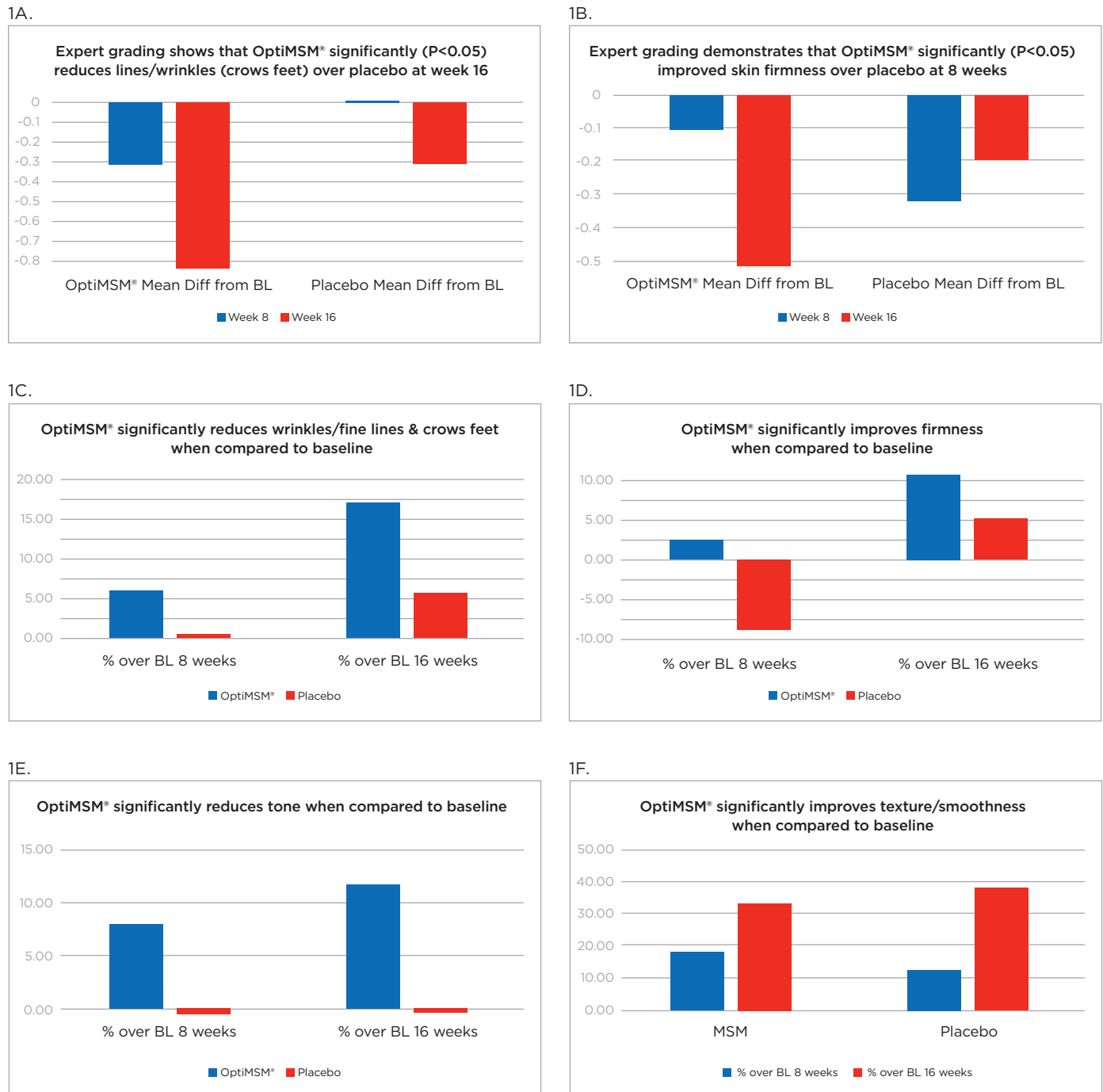
---

## OptiMSM® Research—Skin Health

OptiMSM® when consumed orally has recently shown significant improvements in various facets of skin health. In a 16-week, double-blinded, placebo-controlled, randomized study, twenty three females (age 35-59 yrs) exhibiting facial lines/wrinkles, dryness, roughness and redness of skin consumed 3 x 1000 mg capsules of OptiMSM® or placebo, once daily over 16 weeks. Three forms of analysis were used to assess outcomes: expert grading, self-assessment and instrumentation. Analysis were performed at 0, 8 and 16 weeks. Outcome assessments included presence of crow's feet lines/wrinkles, tone, texture/smoothness, elasticity and firmness of skin. Previous gene marker analysis corroborates these results.

The most significant result observed was a reduction in the number, size and severity of wrinkles for all three assessments. Generally, results demonstrated the OptiMSM® group experienced statistically significant improvement at weeks 8 and 16 for crow's feet/wrinkles, tone and smoothness, and for elasticity and firmness at 16 weeks vs. baseline. When compared with placebo, statistical significance was observed for firmness at 8 weeks, with a strong statistical trend toward improvement in crow's feet/wrinkles at weeks 8 and 16. Vapometer (used to measure skin barrier function) results for the MSM group showed statistically significant improvements when compared to baseline values for skin barrier function at weeks 8 and 16, with 100% of subjects in the MSM group showing improvement at week 16. Melanin increases were also significant vs. baseline at week 16.

**Figure 1: Expert clinical grader evaluation: Compared to placebo—crow's feet line/wrinkles (1A), and firmness (1B). Compared to baseline—crow's feet line/wrinkles (1C), firmness (1D), tone (1E), and skin texture (1F).**



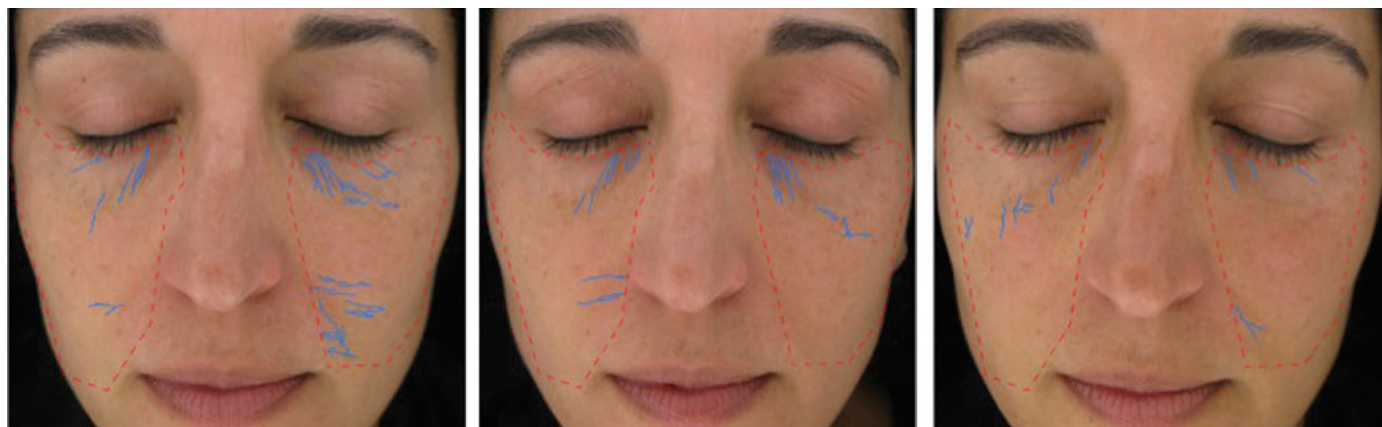
Clarity™ Pro data which is used to analyze wrinkle parameters digitally, shows that in all instances, mean results for the subjects using MSM were significantly better than those for subjects using placebo. Results for analysis of crow's feet fine lines and wrinkles showed MSM made statistically significant improvements over placebo from baseline to week 16 for: Total Wrinkle Count ( $p=0.012$ ), Average Length ( $p=0.019$ ), Average Wrinkle Severity ( $p=0.024$ ), and Deep Lines Count ( $p=0.036$ ). (Figure 2) Results for analysis of global lines and wrinkles showed MSM made statistically significant improvements over placebo from baseline to week 16 for: Total Wrinkle Count ( $p=0.042$ ), Average Length ( $p=0.004$ ), and Average Wrinkle Severity ( $p<0.001$ ), and at week 8 for Average Length ( $p=0.032$ ). (Figure 3) A representative example of Clarity™ Pro analysis using digital lines can be seen in Figure 4.

**Figure 4: A representative example of Clarity™ Pro imaging shows the computer generated wrinkle tracings of the left side for crow's feet analysis (4A), and frontal view for global assessment (4B) for participant in MSM group.**

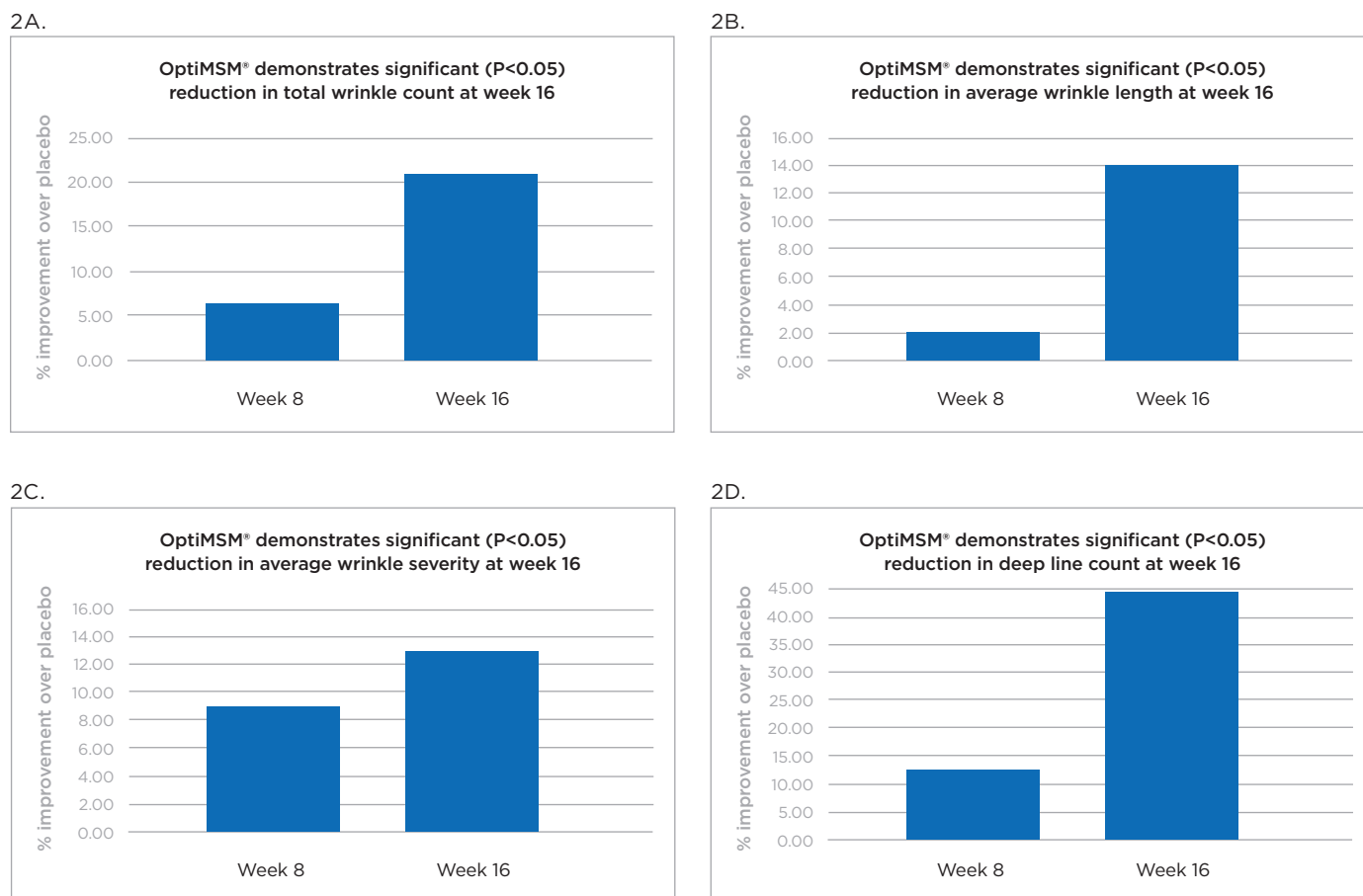
4A. From left to right: baseline, week 8, week 16. (Participant 1)



4B. From left to right: baseline, week 8, week 16. (Participant 1)



**Figure 2: Clarity™ Pro image analysis (pixel count) of fine lines and wrinkles (crow's feet): Total wrinkles (2A), wrinkle length (2B), wrinkle severity (2C), and deep line count (2D).**



## How Does It Work? (Possible Mechanisms)

**(1) A source of bio-available sulfur:** Sulfur has long been a valued ingredient in dermatology and may contribute to the cross-linking of proteoglycans and collagen, as well as serving as a building block for keratin, the chief structural constituent of hair and nails. By maintaining healthy collagen, cross-linking or “hardening” of the tissue is inhibited allowing for healthy dermal function. The loss of ECM proteins highlights skin damage; disulfide bonds are required for structural adhesion and formation and sulfur-containing amino acids (SAA) are required for protein synthesis, and MSM is known to contribute important sulfur-containing amino acids including methionine, cysteine, cystine, homocysteine, homocystine and taurine (Parcell, 2002). MSM may also compartmentalize sulfur sources within the body, sparing necessary building blocks (Krieger, 2009).

**(2) Antioxidant/anti-inflammatory:** Overactive inflammatory responses and increased inflammation can damage dermal cells and degrade structural matrixes leading to signs of aging (Salminen, 2008). OptiMSM has recently shown the capacity to down-regulate certain genes associated with inflammation (IL-6 and TNF- $\alpha$ ) by suppressing the expression of NF- $\kappa$ B. In skin, inhibition of NF- $\kappa$ B benefits the ECM through reduced expression of inflammatory cytokines (Kim, 2009). MSM has also been shown to significantly increase plasma glutathione levels in humans (Nakhostin-Roohi, 2011). OptiMSM intake was associated with increased glutathione and improvement in the ratio of reduced to oxidized glutathione (GSH/GSSG). Animal studies have also corroborated these findings (Amirshahrokhi, 2013; Mohamadi, 2012; Bohlooli, 2013). Glutathione, an important endogenous antioxidant, serves to reduce oxidative stress induced by ultra-violet radiation.



**(3) Increasing barrier function of the extracellular matrix (ECM):** Instrument analysis performed by a vapometer in a recent clinical trial on OptiMSM® suggests MSM may increase barrier function, providing a greater exchange of water and nutrients in the dermis. Pre-clinical results from a gene marker study also suggest MSM can modify the genes (DSG3 and LCE3D) associated with barrier function.

Other attributes:

- Extremely safe; LD-50 > 17,000mg/kg BW
- OU Kosher and Halal certified
- Non-GMO, Non-BSE
- Allergen free - shellfish, nuts, soy, lactose, dairy, gluten
- The only branded form of MSM (OptiMSM®) with continued research support
- GRAS - affirmed w/ FDA Notification and Letter of "No Objection"
- International regulatory approvals

---

## About OptiMSM®

OptiMSM is the world's premier MSM and the only GRAS-affirmed source available in the world. Manufactured exclusively by Bergstrom Nutrition at a dedicated facility in Vancouver, Washington, OptiMSM is the result of a proprietary distillation process that guarantees an ultra-pure product. Bergstrom's stringent quality control ensures batch-to-batch consistency, a fully traceable production process, and includes independent third-party validation of identity and purity.

### OptiMSM is:

- The only U.S. made MSM
- GRAS-affirmed with FDA Notification and Letter of "No Objection"
- Kosher and Halal certified, Non-GMO, Non-BSE, gluten-free, allergen free, non-shellfish derived, and vegan
- Backed by extensive toxicology data and ongoing research
- Extremely safe; LD-50 > 17,000mg/kg BW
- Distributed internationally
- Backed by unmatched technical/manufacturing support

For more information and science updates, visit us at [www.bergstromnutrition.com](http://www.bergstromnutrition.com)



## References

Anthonavage M, Benjamin R, Withee E. Effects of Oral Supplementation with Methylsulfonylmethane on Skin Health and Wrinkle Reduction. *Natural Medicine Journal* Nov 2015; 7(11)

Amirshahrokhi K, Bohlooli S. Effect of methylsulfonylmethane on paraquat-induced acute lung and liver injury in mice. *Inflammation*. 2013;36(5):1111-1121. doi:10.1007/s10753-013-9645-8

Bohlooli S, Mohammadi S, Amirshahrokhi K, et al. Effect of methylsulfonylmethane pretreatment on acetaminophen induced hepatotoxicity in rats. *Iran J Basic Med Sci*. 2013;16(8):896-900.

Hasegawa T, Ueno S, Kumamoto S. Anti - inflammatory effect of methylsulfonylmethane (MSM) in mice. *JpnPharmacolTher* 2005;33(12):1217-2.

Kim YH, Kim DH, Lim H, Baek DY, Shin HK, Kim JK. The anti-inflammatory effects of methylsulfonylmethane on lipopolysaccharide-induced inflammatory responses in murine macrophages. *Bio Pharm Bull*. 2009;32(4):651-6.

Krieger DR, Schwartz HI, Feldman R, et al. A Pharmacokinetic Dose-Escalating Evaluation of MSM in Healthy Male Volunteers. Miami, FL; 2009.

Mohammadi S, Najafi M, Hamzeiy H, et al. Protective effects of methylsulfonylmethane on hemodynamics and oxidative stress in monocrotaline-induced pulmonary hypertensive rats. *Adv Pharmacol Sci*. 2012;2012:507278. doi:10.1155/2012/507278.

Nakhostin-Roohi B, Barmaki S, Khoshkharesh F, Bohlooli S. Effect of chronic supplementation with methylsulfonylmethane on oxidative stress following acute exercise in untrained healthy men. *J Pharm*

*Pharmacol*. 2011;63(10):1290-1294. doi:10.1111/j.2042-7158.2011.01314.x.

Otsuki, S., et al., "Elucidation of dimethylsulfone metabolism in rat using a 35S radioisotope tracer method." *Nutr Res* (2002): 313-322.

Parcell S. Sulfur in Human Nutrition and Applications in Medicine. *Altern Med Rev* 2002;7(1):22-44.

Pearson TW, Dawson HJ, Lackey HB (1981) Natural occurring levels of dimethyl sulfoxide in selected fruits, vegetables, grains, and beverages. *J Agric Food Chem* 29:1089-1091

Salminen A, Huuskonen J, Ojala J, Kauppinen A, Kaarniranta K, Suuronen T. Activation of innate immunity system during aging: NF-kB signaling is the molecular culprit of inflamm-aging. *Ageing Res Rev*. 2008;7(2):83-105. doi:10.1016/j.arr.2007.09.002.

Williams, KIH, Burstein SH, Layne DS. Dimethylsulfone: isolation from cows' milk. *Proc. Soc. Exp. Biol. Med* 1966.

The information provided is for business and informational purposes by the user and not for use in any manner whatsoever for consumer use or in any manner unless specifically provided for and mentioned. The information provided is specifically for use in evaluation of ingredients and formulas in a finished dosage form and is derived from calculations based on raw material data exclusively owned by Bergstrom Nutrition. Bergstrom Nutrition or their Authorized Distributors do not assume any risk of liability in any manner whatsoever for any commercial or non commercial use of the information so provided.