

Retinoids: The Anti-Aging and Skin Repair Workhorse

Posted on January 20, 2017 by [George Deckner](#)

The retinoids are a class of oil soluble compounds related to vitamin A including Retinol, Retinal, Retinoic acid and Retinyl esters. Carotenoids, like Beta Carotene, are sometimes referred to as pro Retinoids since they can be converted into vitamin A by the body.

Retinoids have many important functions in the body including eye health, regulation of cell proliferation/differentiation, bone growth, immune function, and the activation of tumor suppressor genes.

The major dietary sources of retinoids are plant carotenoids and Retinyl esters derived from animal derived foods¹. The main form of vitamin A in the body is Retinyl Palmitate, which is converted to Retinol in the small intestine. Retinol is a storage form of the vitamin that and can also be converted to Retinal which is important for eye health². Retinoids are found in keratinocytes mainly as Retinol and Retinyl esters.

Retinoids are used in the Rx treatment of many dermatological conditions including photodamaged skin (trans Retinoic acid, Tazarotene), Acne (13-cis Retinoic acid, Tazarotene), and Psoriasis (Acitretin, Tazarotene).

The topical Retinoids used in personal care include:



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- Retinol
- Retinal
- Retinyl Acetate
- Retinyl Propionate
- Retinyl Retinoate
- Hydroxypinacolone Retinoate
- Retinyl Palmitate

All of these Retinoids - with the exception of Retinyl Palmitate – have been shown to be effective at reducing fine lines and wrinkles, skin roughness, hyperpigmentation, and improving skin texture. Retinoids are believed to work by increasing cell turnover, preventing collagen breakdown, and by thickening the epidermis.

Retinol is the gold standard and one of the top performing skin repair actives currently available. When topically applied, Retinol is oxidized to Retinal, which is further oxidized to trans Retinoic acid. It has been reported that Retinol is ~20 times less potent than trans Retinoic acid due to this extra conversion step.

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Several studies comparing the efficacy of 0.05% Retinaldehyde with 0.05% trans Retinoic acid for the treatment of photoaged skin demonstrated that both Retinaldehyde and trans Retinoic acid were equally effective in reducing wrinkles and skin roughness and are probably more effective than Retinol. However, trans Retinoic acid resulted in a higher incidence of skin irritation than Retinaldehyde³.

To encourage consumer compliance, managing Retinoid-induced skin irritation is important for any new skin repair product. Using polar emollients can reduce irritation by slowing down active release and skin penetration, however this approach probably has a negative effect on efficacy.

Other approaches reported include the use of:

- skin barrier building ingredients (e.g. Niacinamide-Jubilant Life Sciences)
- cosmetic soothing ingredients (e.g. Bisabolol, Dragosantol® 100, Symrise)
- D-Panthenol (BASF Care Creations)
- Dipotassium Glycyrrhizinate (Mafco Worldwide LLC)
- ingredients for making skin less sensitive (e.g. Hydroxyphenyl Propamidobenzoic Acid – SymSitive® 1609, Symrise) (7).

Polar emollients used commercially for irritation reduction include PPG 15 Stearyl Ether (Arlamol PS15E, Croda), PPG-2 Myristyl Ether Propionate (Crodamol PMP, Croda), and sunscreens⁴.

Another interesting strategy for decreasing irritation and increasing efficacy is to combine Retinol with a Retinol mimic. These mimics claim to modify gene activation in a similar manner to Retinol.

In a published clinical study, .04% Retinol combined with .1% Dihydroxy Methylchromone (DHC-RonaCare Luremin, EMD) and low molecular weight Hyaluronic acid was more effective than .1% Retinol alone at improving photoaged skin⁸.

Sytenol® A (Bakuchiol-Sytheon) is another reported Retinol mimic that also claims to help stabilize Retinol⁹. Retinoids reported in the literature as being less irritating than Retinol include Hydroxypinacolone Retinoate (Granactive Retinoid, Grant Industries) and Retinyl Retinoate (k3 Retino-A, Ultra Chemical)^{5,6}.

Stabilizing Retinoids is another important formulation consideration since they easily oxidize, isomerize to a less active form, and are not very photostable.

Stability recommendations (target >90% after one month at 40°C)

- Most Retinoids have optimum stability at a pH of 6-7
- Lamellar gel network based oil in water formulation can help protect against oxidation. Retinol and Retinal can incorporate into the crystalline lamellar phase providing protection against Oxygen.
- Use chelating agents
- Use a combination of oil and water soluble antioxidants
- Avoid using unsaturated emollients and fragrances in the formulation

- Sparge batch making water before using by bubbling Nitrogen into the water until the Oxygen concentration drops below 1ppm.
- Use a package that prevents Oxygen incorporation into the product during use (Aluminum laminate tube). A positive displacement pump may also work.
- Retinoid products applied to skin during the day should contain SPF and or photostabilizers.

Commercially available Retinoids

- Vitamin A Palmitate 1.7 MIU/g (Retinyl Palmitate-DSM Nutritional Products)
- Retinol 15 D (Caprylic/Capric Triglyceride (and) Retinol-BASF Care Creations)
- RetiStar Stabilized Retinol (Caprylic/Capric triglyceride (and) Sodium Ascorbate (and) Tocopherol (and) Retinol-BASF Care Creations)
- Retinol 50 C (Retinol (and) Polysorbate 20-BASF Care Creations)
- PromaCare VAA (100MIU G) (Retinyl Acetate-Uniproma Personal Care Division)
- Granactive Retinoid (Dimethyl Isosorbide (and) Hydroxypinacolone Retinoate-Grant Industries) – claimed to be less irritating than Retinol and effective without needing to be metabolized to Retinoic acid
- k3 Retino-A (Retinyl Retinoate -Ultra Chemical) - claimed to be more photo and heat stable than Retinol. A clinical study using 0.06% Retinyl Retinoate cream for three months showed decreased depth and area of wrinkles similar to 0.075% Retinol cream. Skin roughness also improved more than the Retinol cream.
- All-Trans-Retinal (Retinal-Spectrum Chemical Mfg. Corp.)

References

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4. Topical oil-in-water emulsions containing retinoids-US 5976555, Johnson and Johnson, 11/2/99
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9. Stenol A (Bakuchiol-Sytheon) supplier brochure.

Microsponge® N 709 RE (MSN 709RE) is a retinol delivery system based on the novel Microsponge® N natural microparticle. The MSN technology provides sustained released retinol to your anti-aging formulations and provides efficacy with reduced irritation compared to conventional formulations. MSN 709RE is an off-white to pale yellow free flowing powder that can be readily dispersed in gels, emulsions and powders, minimizing the discoloration problems associated with many retinol products. MSN 709RE also is a source of BHA-free retinol and is not subject to listing under California Proposition 65.

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