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THE IMPORTANCE OF VITAMIN A IN SKIN CARE

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Abstract

Vamin A is a vital fat-soluble nutrient that plays a central role in maintaining overall health, with particularly significant effects on skin structure and function. Its biologically active form, retinoic acid, exerts its effects by binding to nuclear receptors—retinoic acid receptors (RARs) and retinoid X receptors (RXRs)—which regulate the expression of genes involved in skin cell proliferation, differentiation, and repair. Through these molecular mechanisms, vitamin A ensures proper epidermal renewal, maintains the integrity of the skin barrier, stimulates collagen production, and supports wound healing. These processes explain its therapeutic value in dermatology for the treatment of conditions such as acne, hyperkeratinization disorders, photoaging, and other skin pathologies.

Vitamin A deficiency can result in noticeable dermatological manifestations, including dryness, rough skin, follicular hyperkeratosis, and impaired wound healing, whereas excessive intake may lead to toxicity with symptoms such as redness, peeling, and increased skin sensitivity. Beyond its clinical relevance, vitamin A is an important nutrient in daily nutrition, obtained from animal sources such as liver, eggs, and dairy, as well as plant-based carotenoids like carrots, spinach, and sweet potatoes.

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This article provides a comprehensive overview of the biochemical, physiological, and clinical roles of vitamin A in skin health. By combining molecular insights with dietary and clinical information, it offers a resource that is informative for both medical professionals and general readers, highlighting the importance of balanced vitamin A intake for maintaining healthy, resilient, and youthful skin.

Keywords: Vitamin A, retinoids, retinol, retinaldehyde, skin cell differentiation, keratinocyte proliferation, epidermal turnover, collagen synthesis, fibroblast activity, nuclear receptors (RAR, RXR), gene expression regulation, skin irritation, dryness (xerosis), erythema, photosensitivity, retinoid dermatitis, teratogenicity.

Annotatsiya

A vitamini — bu organizm uchun muhim yog‘da eriydigan oziq modda bo‘lib, umumiy sog‘liqni saqlashda markaziy rol o‘ynaydi va terining tuzilishi va funksiyasiga alohida ta’sir ko‘rsatadi. Uning biologik faol shakli, retinoik kislota, yadrodagi retinoik kislota retseptorlari (RAR) va retinoid X retseptorlari (RXR) bilan bog‘lanib, teri hujayralarining o‘sishi, differensiyalashuvi va tiklanishini boshqaruvchi genlarning ifodalanishini tartibga soladi. Ushbu molekulyar mexanizmlar orqali A vitamini epidermal yangilanishni ta’minlaydi, teri to‘sig‘ining yaxlitligini saqlaydi, kollagen sintezini rag‘batlantiradi va yaralarni bitishini qo‘llab-quvvatlaydi. Shu sababli u dermatologiyada akne, giperkeratoz kasalliklari, fotoqarish va boshqa teri patologiyalarini davolashda muhim vosita sifatida ishlatiladi.

A vitamini yetishmovchiligi terida namoyon bo‘lishi mumkin bo‘lgan belgilarni keltirib chiqaradi: quruqlik, terining qattiqlashishi, follikulyar

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giperkeratoz va yaralarni sekin bitishi; ortiqcha qabul esa terining qizarishi, toshishi va sezgirligining oshishi kabi toksik belgilarga olib kelishi mumkin. Shuningdek, A vitamini kundalik oziqlanishda ham muhim bo‘lib, hayvon manbalaridan (jigar, tuxum, sut mahsulotlari) va o‘simlik manbalaridan (sabzi, ismaloq, shirin kartoshka) olinadi.

Ushbu maqola A vitaminining teri salomatligidagi biokimyoviy, fiziologik va klinik rollarini keng qamrovli tarzda o‘rganadi. Molekulyar bilimlarni, ovqatlanish va klinik ma’lumotlar bilan uyg‘unlashtirib, maqola ham tibbiyot mutaxassislari, ham oddiy o‘quvchilar uchun foydali manba bo‘lib xizmat qiladi va sog‘lom, bardoshli va yosh terini saqlash uchun A vitaminining muhimligini ta’kidlaydi.

Kalit so’zlar: A vitamin, retinoidlar, retinol, retinaldegid, teri hujayralarining differensiyatsiyasi, keratinotsitlar proliferatsiyasi, epidermisning yangilanishi, kollagen sintezi, fibroblastlar faolligi, yadro retseptorlari (RAR, RXR), gen ekspressiyasini boshqarish, teri tirnashishi, teri quruqligi (kseroz), eritema (teri qizarishi), fotosensitivlik (yorug‘likka sezuvchanlik), retinoid dermatiti, teratogenlik.

Аннотация

Витамин А — это жизненно важный жирорастворимый микроэлемент, который играет ключевую роль в поддержании общего здоровья и оказывает особенно значимое влияние на структуру и функцию кожи. Его биологически активная форма, ретиновая кислота, связывается с ядерными рецепторами — ретиноевыми рецепторами (RAR) и ретиноидными Х-рецепторами (RXR), регулируя экспрессию генов, ответственных за пролиферацию, дифференцировку и восстановление

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клеток кожи. Через эти молекулярные механизмы витамин А обеспечивает обновление эпидермиса, поддерживает целостность кожного барьера, стимулирует синтез коллагена и способствует заживлению ран. Благодаря этим свойствам он широко используется в дерматологии для лечения акне, гиперкератозов, фотостарения и других кожных патологий.

Дефицит витамина А может проявляться в виде сухости кожи, огрубения, фолликулярного гиперкератоза и замедленного заживления ран, тогда как избыточное поступление может привести к токсическим эффектам: покраснению, шелушению и повышенной чувствительности кожи. Витамин А также является важным элементом ежедневного питания и содержится в продуктах животного происхождения (печень, яйца, молочные продукты) и растительного происхождения (морковь, шпинат, сладкий картофель).

Данная статья представляет собой всесторонний обзор биохимических, физиологических и клинических ролей витамина А в здоровье кожи. Сочетая молекулярные данные с информацией о питании и клинической практике, она служит полезным ресурсом как для медицинских специалистов, так и для широкой аудитории, подчеркивая важность сбалансированного потребления витамина А для поддержания здоровой, упругой и молодой кожи.

Ключевые слова: Витамин А, ретиноиды, ретинол, ретинальдегид, дифференцировка клеток кожи, пролиферация кератиноцитов, обновление эпидермиса, синтез коллагена, активность фибробластов, ядерные рецепторы (RAR, RXR), регуляция экспрессии генов,

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раздражение кожи, сухость кожи (ксероз), эритема (покраснение кожи), фотосенсибилизация, ретиноидный дерматит, тератогенность.

Introduction

Vitamin A is a fat-soluble vitamin that is essential for numerous physiological processes, and it plays a particularly important role in maintaining healthy skin. Often referred to as the "skin vitamin," it is critical not only for the appearance of the skin but also for its proper structure, function, and resilience. The active form of vitamin A, retinoic acid, regulates gene expression in skin cells, including keratinocytes and fibroblasts, which are responsible for epidermal renewal and collagen production. Through this molecular mechanism, vitamin A ensures that the skin remains smooth, elastic, and capable of repairing itself efficiently.

In addition to its role in skin structure, vitamin A contributes to the maintenance of the skin barrier, protecting against environmental damage, pathogens, and excessive water loss. It also helps control cell turnover, preventing accumulation of dead cells and reducing the risk of clogged pores, which can lead to acne. Both deficiency and excess of vitamin A can result in noticeable skin problems: deficiency may cause dryness, roughness, or follicular hyperkeratosis, while excessive intake can lead to toxicity with symptoms such as peeling, redness, or sensitivity.Understanding the function of vitamin A on a cellular level provides valuable insights for both ordinary readers interested in skincare and nutrition, and medical professionals who use retinoids in dermatology to treat acne, photo aging, and other skin disorders. By combining basic nutritional knowledge with molecular and clinical understanding, we can appreciate the full spectrum of vitamin A's

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impact on skin health, emphasizing the importance of a balanced intake for maintaining youthful, resilient skin and overall well-being.

Main part

What are vitamin A and carotenoids and what do they do?

Vitamin A is a fat-soluble vitamin that is naturally present in many foods. Vitamin A is important for normal vision, the immune system, reproduction, and growth and development. Vitamin A also helps your heart, lungs, and other organs work properly. Carotenoids are pigments that give yellow, orange, and red fruits and vegetables their color. Your body is able to convert some carotenoids into vitamin A.

There are two different sources for vitamin A:Preformed vitamin A is found in fish, organ meats (such as liver), dairy products, and eggs.

Provitamin A carotenoids are turned into vitamin A by your body. They are found in fruits, vegetables, and other plant-based products. The most common provitamin A carotenoid in foods and dietary supplements is beta-carotene.

How much vitamin A do I need?

The amount of vitamin A you need depends on your age and sex. Average daily recommended amounts of preformed vitamin A and provitamin A carotenoids are listed below in micrograms (mcg) of retinol activity equivalents (RAE).

Life Stage Recommended Daily Amount

Birth to 6 months 400 mcg RAE

Infants 7–12 months 500 mcg RAE

Children 1–3 years 300 mcg RAE

Children 4–8 years 400 mcg RAE

Children 9–13 years 600 mcg RAE

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Teen males 14–18 years 900 mcg RAE
Teen females 14–18 years 700 mcg RAE
Adult males (19 years and older) 900 mcg RAE
Adult females (19 years and older) 700 mcg RAE
Pregnant teens (14-18 years) 750 mcg RAE
Pregnant women (19 years and older) 770 mcg RAE
Breastfeeding teens (14-18 years) 1,200 mcg RAE
Breastfeeding women (19 years and older) 1,300 mcg RAE
What foods provide vitamin A?
Vitamin A is found naturally in many foods and is added to some foods, such as milk and cereal. You can get recommended amounts of vitamin A by eating a variety of foods, including the following:Some types of fish, such as herring and salmon
Beef liver and other organ meats (which are also high in cholesterol, so limit the amount you eat)
Green leafy vegetables and other green, orange, and yellow vegetables such as spinach, sweet potatoes, carrots, broccoli, and winter squash
Fruits, including cantaloupe, mangos, and apricots
Dairy products, such as milk and cheese
Fortified breakfast cereals
Eggs
Safety and side effects
Too much vitamin A can be harmful. Taking a single large dose of 200,000 mcg or many large doses can cause:
- Nausea.
- Vomiting.
- Fatigue.

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- Dizziness.
- Blurry vision.

Taking more than 10,000 mcg a day of oral vitamin A supplements long-term can cause:

- Balance issues.
- Liver damage.
- Headache.
- Nausea.
- Hair loss.
- Dry skin.
- Pain in the joints and bones.
- Rarely, death.

If you are or might become pregnant, talk with your healthcare professional before taking vitamin A. The use of too many vitamin A supplements during pregnancy has been linked to birth defects. So has applying vitamin A creams to the skin. Examples include the creams isotretinoin and etretinate.

Within the epidermis, retinoids activate basal cell mitosis, and healthy keratinocytes are generated. By thickening the epidermal layer, they fortify the protective capacity of the skin. The keratinocyte cycle is also enhanced, and the exfoliative process restored to 6 weeks, providing a characteristic ethereal ‘glow’. Stratum corneum is compacted, while keratin composition becomes more gelatinous, lending to a softer, smoother outward appearance. Additionally, the water, lipid, and protein balance is repaired, thus restoring barrier function and reversing sensitivity. Melanin formation is further decreased, and existing pigment digested and distributed evenly to surrounding keratinocytes. Regarding the dermis, retinoids have been shown to stimulate fibroblast activity, and alter the core matrix components.

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Neocollagenesis (type I, II, and III) occurs through increases in transforming growth factor beta (TGβ) and procollagen, while collagenase activity is simultaneously suppressed. A surge in elastin deposition can also be witnessed histologically, leading to a reduction in surface lines and wrinkles. Glycosaminoglycan (GAG) and natural moisturising factor (NMF) production are further upregulated, so that innate hydration is re-established. Angiogenesis also increases, maximising the delivery of nutrients, and the removal of waste materials. This enhancement in cutaneous circulation is likely responsible for the improved wound healing observed with retinoids.

How to Use Retinol for Acne Without Irritation

When used correctly, retinol can transform acne-prone skin. When used incorrectly, it can cause dryness and irritation. Here's how to use it safely and effectively.

Step-by-Step Routine

✓ Cleanse Gently: Use a mild, non-foaming cleanser suitable for acne-prone skin.

✓ Wait 10–15 Minutes: Apply retinol only to completely dry skin — moisture increases absorption and risk of irritation.

✓ Apply a Pea-Sized Amount: More isn't better; a small amount covers the entire face.

✓ Moisturize: Apply a non-comedogenic moisturizer afterward to help soothe and protect the skin.

✓ Protect with SPF: Apply sunscreen daily; retinol increases sun sensitivity.

✓ Common Mistakes to Avoid

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✓ Mixing with strong acids (AHAs/BHAs) or benzoyl peroxide on the same night.
✓ Using too frequently, too soon — increase use gradually.
✓ Applying to damp skin or using more than directed.

What Strength of Retinol Is Best for Acne-Prone Skin?

Choosing the right strength is crucial. Stronger isn't always better — especially for skin already dealing with inflammation or sensitivity.

Retinol Strength Best For Description

0.25% Beginners or sensitive skin Gentle introduction to retinoids; minimal irritation

0.5% Moderate acne or transitioning users Stronger exfoliating and brightening benefits.

How Long Until You See Results?

Most users start to notice smoother texture and fewer breakouts within 4–6 weeks, with more visible improvements in acne marks and tone by 8–12 weeks.

Consistency is key. Retinol works gradually, training your skin to function better over time — it's a marathon, not a sprint.

Can You Combine Retinol With Other Acne Treatments?

Yes — but strategically.

Safe Pairings:

Niacinamide: Calms redness and improves the moisture barrier.

Hyaluronic Acid: Provides hydration without clogging pores.

Azelaic Acid: Can be alternated with retinol on different nights for added tone correction.

Avoid Together:

Benzoyl Peroxide (unless in separate routines — AM/PM split)

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Strong exfoliating acids (AHAs/BHAs on the same night)

Rotating active ingredients prevents overexfoliation and maintains healthy skin barriers.

FAQs About Retinol and Acne-Prone Skin

1. Can retinol make acne worse before it gets better?

Yes — during the first 2–4 weeks, you may experience "purging" as clogged pores clear faster. This is a temporary sign that the retinol is working.

2. Is retinol safe for oily skin?

Absolutely. Retinol helps regulate sebum production, reducing excess oil and shine.

3. Can I use retinol with salicylic acid?

Not at the same time. Alternate on different nights to avoid irritation.

4. What if my skin feels dry or tight after using retinol?

Apply moisturizer immediately after retinol or try the "sandwich method" — moisturizer before and after application.

5. How often should I use retinol if I'm a beginner?

Start with 2–3 times per week, then increase as your skin builds tolerance.

6. Is retinol suitable for body acne?

Yes — retinol can help reduce breakouts on areas like the chest or back, though higher concentrations may be needed.

7. Can I use retinol year-round?

Yes, but always apply sunscreen daily to protect from increased sun sensitivity.

8. When should I stop using retinol?

Pause use if you experience persistent irritation or flaking. Once your skin calms, restart at a lower frequency.

Final Takeaway: The Smart Way to Use Retinol for Acne-Prone Skin

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Retinol is one of the most powerful tools for achieving clear, smooth, and resilient skin — but success depends on formulation and consistency.
By choosing a non-comedogenic, dermatologist-designed retinol, you can enjoy all the benefits of this Vitamin A powerhouse without aggravating your acne.

Conclusion

Vitamin A is an essential nutrient that plays a crucial role in maintaining healthy skin. Its active form, retinoic acid, regulates skin cell growth, differentiation, and repair by controlling gene expression through nuclear receptors. This molecular mechanism explains why vitamin A is critical for maintaining the skin barrier, stimulating collagen production, and preventing dryness, roughness, and acne. Both deficiency and excess can lead to noticeable skin problems, highlighting the importance of balanced intake. Understanding these functions not only benefits ordinary readers seeking healthy skin but also provides valuable insights for medical professionals in dermatology and clinical practice.

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