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## Review Article

# Retinol: A Magical Ingredients for Improving the Skin Texture

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### ABSTRACT

Nowadays, numerous skincare routines are used to rejuvenate aging skin. Retinoids are one of the most popular ingredients used in antiaging. Retinol has been shown to improve fine lines and wrinkles, hyperpigmentation, skin roughness, and the appearance of photoaged skin. The efficacy and tolerability of retinol makes it preferable to prescription retinoids as many patients are intolerant of these more potent forms. In this review, we will discuss the pharmacokinetics of retinol and the clinical studies confirming its efficacy, tolerability, and safety with long-term use.

### INTRODUCTION

Retinol (vitamin A) is a highly potent, active cosmetic ingredient for skin care. Retinol is a form of vitamin A with many uses in skin care. It's used to treat acne and has anti-aging effects. You can buy retinol over the counter (without a prescription) or visit your healthcare provider to discuss how retinol might best fit into your skincare routine. Your provider may prescribe medications that contain higher concentrations of retinoids than you can get over the counter.

Retinol is a topical treatment, meaning you apply it on top of your skin. Retinol comes in many forms, including:

- Creams.
- Gels.
- Lotions.

- Ointments.
- Serums.

Retinol is also sometimes used as an ingredient in cosmetic products. In particular, the material is quite useful as an anti-aging treatment. Retinol is a member of the class of skin care actives known as retinoids. Retinol is highly susceptible to oxidative degradation. It is intrinsically unstable when exposed to light, oxygen, heat, and acids. Therefore, it requires stabilization in personal care formulations. In a cosmetic emulsion, for example, retinol is usually stabilized by manufacturing the formulated product at low temperatures and at a pH between 6 and 8 under an inert atmosphere such as nitrogen or argon. Reti STAR™ is a unique combination of retinol and an antioxidant system that effectively addresses these issues. The

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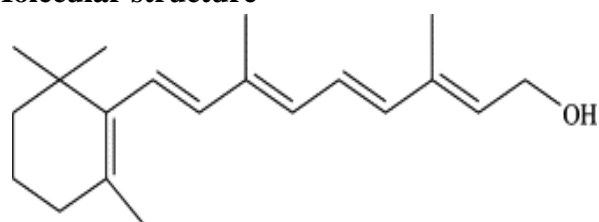
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product prevents the degradation of the active ingredient retinol during storage of personal care emulsions. This preventative reaction occurs without the need for use of an inert atmosphere during emulsion preparation and packaging processes. It has long been known that vitamin E (tocopherol) and vitamin C (ascorbic acid) are potent antioxidants. The combination of these two vitamins is well-known to function in a redox cycle and to scavenge organic free radical species as first described by Packer.

### Chemistry <sup>(3)</sup>

#### Molecular structure=



**Molecular formula**= C<sub>20</sub>H<sub>30</sub>O

**Synonyms**= Vitamin A; Retinol; Preformed vitamin A

**IUPAC name**= (2Z,4E,6E,8E)-3,7-dimethyl-9-(2,6,6-trimethylcyclohex-1-en-1-yl) nona-2,4,6,8-tetraen-1-ol

**Molecular weight**=286.459g/mol

**Physical description**= Vitamin A appears as yellow crystals or orange solid. Practically water insoluble.

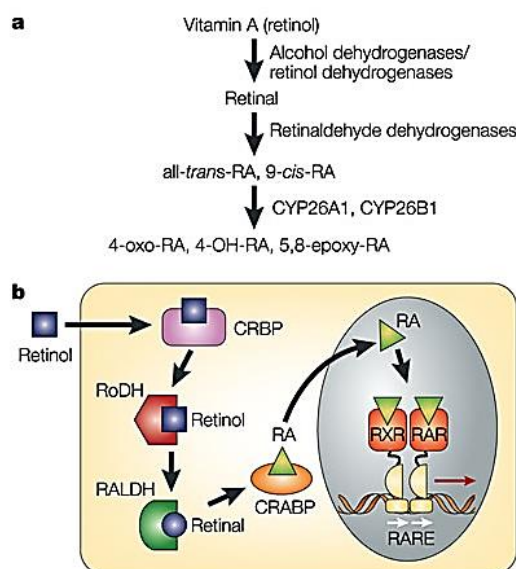
**Form** = Retinol serum is in a liquid form.

**Boiling point**= 137–138 °C (279–280 °F)

**Melting point**= 62–64 °C (144–147 °F)

### Mechanism Of Action <sup>(4)</sup>

Pathways for the synthesis and mechanism of action of retinoic acid (RA). a | The metabolic pathway that converts vitamin A (retinol) into the various forms of retinoic acid (RA), which involves three classes of enzymes. b | The cellular mechanism of retinoid action. Retinol is taken up from the blood and bound to CRBP (cellular retinol-binding protein) in the cytoplasm. The retinol dehydrogenase (RoDH) enzymes metabolize retinol to retinal, then retinal is metabolized to RA by the retinaldehyde dehydrogenases (RALDHs). RA is bound in the cytoplasm by CRABP (cellular RA-binding protein). RA enters the nucleus and binds to the RA receptors (RARs) and the retinoid X receptors (RXRs), which themselves heterodimerize and bind to a sequence of DNA known as the RARE (RA-response element). This activates transcription of the target gene.



**Fig. 1: Mechanism of action of Retinol**

**Uses** <sup>(5, 6)</sup>

◆ Acne

Retinol helps keep pores clear by reducing the buildup of skin cells. Plus, it can block inflammation pathways in the skin.

In a nutshell, that means retinol doesn't only help reduce the number of breakouts you have. It can also minimize the redness and swelling that comes with them.

#### ◆ **Aging support**

Skin cells naturally turn over, revealing fresh cells underneath.

But this happens less frequently as you age, which can lead to a duller complexion. You might also begin to notice fine lines and wrinkles — these can appear at any age.

Retinol helps speed up this turnover process and promote brighter, smoother skin. It also goes deeper into the skin to encourage collagen production and further plump the skin.

#### ◆ **Sun damage**

Faster skin cell turnover can also help improve skin tone.

This can have particular benefit when you have signs of sun damage, like:

- wrinkles
- fine lines
- hyperpigmentation

Retinol can even strengthen the skin, helping protect it against further environmental damage. (Just keep in mind it can leave the top layer of skin thinner and more sensitive to sunlight, so you'll want to apply sunscreen with extra vigilance.)

#### ◆ **Treats Hyperpigmentation**

Retinol may also help treat hyperpigmentation—dark spots where you have more skin pigment caused by hormonal changes, sun damage, or acne scarring. Increasing cell turnover helps exfoliate the skin, smoothing the outer layer of the skin and allowing new skin cells to grow faster. This helps smooth the skin for a more even skin tone and lightens the appearance of dark spots.<sup>5</sup>

Small percentages of retinol may also be effective at treating hyperpigmentation. A small 2020 study

of 37 people found using 0.3 and 0.5% retinol serums once a day for 12 weeks helped reduce hyperpigmentation and uneven skin tone.

#### **What does Retinol do?**

Retinol's versatility in addressing different skin issues is backed by science and data.

#### **Minimize fine lines and wrinkles by creating a plumping effect.**

When applied, retinol penetrates and stays in the epidermis and dermis, triggering the skin's collagen production. As a result, the skin appears full and firm, and the signs of aging, such as fine lines and wrinkles, become less prominent.

#### **Refine skin texture through increased skin cell turnover.**

Retinol promotes a faster turnover of skin cells. As new skin cells grow, dead skin cells are removed and replaced by younger, healthier ones. As such, the skin becomes smoother and softer.

#### **Clear clogged pores in oily and acne-prone skin.**

Retinol's presence on the skin's outermost layer helps remove dirt and oil from pores, resulting in blemish-free skin.

#### **Fade sun spots and other signs of sun damage.**

Healthy skin is characterized by an even tone, and here, retinol scores high. The consistent application helps minimize skin pigmentation, as was the case with the participants of a 2020 study who used retinol serums for eight weeks.

#### **Brighten complexion as a result of cell renewal.**

With cellular turnover happening faster because of retinol, your skin brightens and looks more youthful.

#### **Improve skin elasticity by improving its cellular structure.**

As a vitamin A derivative, retinol has tiny molecules that attached to DNA and stimulates cellular activities in healthy skin.

#### **Treat acne through its anti-inflammation properties.**

Besides removing impurities on the skin's surface, retinol prevents inflammation-causing molecules



from entering the pores. Acne treatments that use retinol have been the subject of several studies,

and the findings are consistent: retinol is safe and effective.



Fig. 2: What does retinol do?

### What Are The Precautions And Side Effects Of Retinol Serum? (7)

Sometimes, retinol, a highly potent ingredient, can damage your skin, especially if you are using it for the first time or incorporated too quickly into your skincare regime. When you add retinol for the first time into your skincare process, you might notice new breakouts, acne, and flakiness. However, these side effects typically last a few days before easing out. Retinol serums come in various strengths, and their potency depends on the type of retinol serum you purchase. The best way to deal with a skin flare-up after initial usage is to include low-potency retinol-based serums. Then, use it on alternate days and slowly increase the frequency.

Start by using the serum once a week, gradually work it a couple of times a week, etc. Moreover, using it with other hydrating serums such as Bodytales Hyaluronic acid sermus helps mitigate the harsh effects of retinol quickly. Remember that retinol interacts with the sun, and any exposure increases irritation and skin sensitivity. So always make sure to use sunscreen to protect yourself when using retinol serums – even in winters.

The downsides to using retinol serums don't last very long – typically ranging from a couple of

weeks to a month. And, it is not a magic drug that can completely turn back the effects of time on your skin. It does help massively, but it takes time. So, you must be patient and consistent while using any retinol serum. Any serum is best applied to freshly cleansed skin. Make sure you apply the retinol serum as directed and allow it to be completely absorbed by your skin. We recommend using skin cell regeneration serums to be used preferably at night. Some types of retinoids are strictly not recommended for pregnant and breastfeeding women. Selecting the right retinol serum is highly important when you want the best results. Although several retinol-based serums are flooding the market, caution must be taken when selecting the one for you. We suggest Bodytales Age-defying body tales that works wonders for your skin. Try it, and with time, you can reverse the effects of time on your skin.

### Side Effects

Many people report side effects of retinol and retinoids, often called the “retinol uglies”, which may include:

- Dryness
- Irritation
- Skin colour changes

Sensitivity to sunlight  
Redness  
Swelling  
Crusting  
Blistering  
Retinol burn

### **How And When to Use Retinol? <sup>(8)</sup>**

Starting a new routine can feel overwhelming. But we have you covered with eight tips to keep in mind as you incorporate retinol into your skin care routine.

#### **1. Always start slowly**

It can take time for your skin to get used to a retinoid. Start by applying it once or twice a week, and always at night. As your skin adjusts, you can work your way up to using it nightly. If your skin gets red, dry, or flaky, you may be moving too fast. Try using it less often until these side effects resolve, and then increase slowly. Once you're comfortable with nightly use, you can consider increasing the strength.

#### **2. Use only a pea-sized amount**

When it comes to retinoids, a little bit goes a long way. In general, a pea-sized amount is enough for your whole face. Dab it on your forehead, nose, cheeks, and then your chin. Gently rub it in to distribute the product evenly.

#### **3. If you're prone to acne, beware of 'purging'**

Around 20% of people who use retinoids get a flare during the first few weeks after starting it. But don't give up. It can take up to 12 weeks to see full results.

#### **4. Stick to mild, gentle skin care products**

Retinoids can be irritating, especially at first. It's best to avoid using them with other sources of irritation, like:

- Benzoyl peroxide
- Salicylic acid
- Alpha hydroxy acids
- Scrubs
- Exfoliators

#### **5. Moisturize your skin**

Retinoids can cause dryness and irritation (retinol dermatitis). Using a moisturizer can help. If your skin is dry or sensitive, you can apply your retinoid on top of a moisturizer.

#### **6. Protect your skin from ultraviolet (UV) rays**

Retinoids can make your skin more sensitive to burning, even if you only apply it at night. Avoid tanning beds. Apply a broad-spectrum sunscreen daily. It should be SPF 30 or higher and cover UVA and UVB rays. Reapply frequently when outside.

#### **7. Stop your retinoid before any facial procedure**

Retinoids increase your skin's sensitivity. It's best to stop using them for 5 to 7 days before waxes, peels, lasers, and other facial procedures.

#### **8. Don't use a retinoid if you're pregnant or could be pregnant**

Most experts advice against using a retinoid during pregnancy or while you're breastfeeding. For acne, alternatives include OTC alpha hydroxy acids (look for ingredients like glycolic or lactic acid) or prescription-strength azelaic acid (Azelex).



**Fig. 3: Mistakes to avoid**

**What Are The Skin Concerns It Could Address? <sup>(9)</sup>**



**Fig. 4: Skin concerns it could address.**

But before you dive into an ingredient, let's understand if you really need to include this ingredient in your skincare. Here are some skin concerns that Retinol could address:

**1. Whiteheads and blackheads**

Retinol has the power to dissolve dead skin and remove excess oil and eliminate acne-causing bacteria from your skin. It does this by increasing the cell turnover that helps unclog your pores and decrease whiteheads and blackheads on your skin.

**2. Fine lines and Wrinkles**

Just as we mentioned, Retinol does increase the cell turnover that stops dead skin from accumulating. This drastically shows younger and smoother looking skin which we all aim for!

**3. Sun damage and hyperpigmentation**

Sun damage results in deforming and inflaming your skin, which is why you get dark spots due to sun damage. This is because the skin has gathered a pigmented protein called melanin where your skin is damaged. Retinol helps you revive the skin cells that will help you fade the dark spots over a period of time.

#### 4. Acne scars

Once the acne is gone, your skin is left with a wound. To protect that wound, your skin will

gather melanin in that area, which gives you that annoying brown mark. With the help of Retinol, your skin will regenerate to fade that mark sooner.



**Fig. 5:** Before (on the left) and after (on the right) uses of Retinol

#### What Are The Different Forms Of Retinoids And Which One Should You Look Out For? <sup>(9)</sup>

Retinoids			
	EFFICACY	IRRITATION	POTENCY
Retinoic Acid/ Tretinoin	VERY HIGH	VERY HIGH	0.01%-0.05%
Retinaldehyde/ Retinal	VERY HIGH	HIGH	0.01%-0.10%
Retinol	HIGH	MEDIUM	0.2%-1%
Retinyl Esters	LOW	LOW	0.1%-0.5%

**Fig. 6:** Types of Retinol

As we mentioned earlier, Retinol is a form of Retinoid. For OTC products, only Retinol is used since it is less reactive than Retinoid. But the secret is that Retinoids have many forms and they all have different strengths. Let's walk through each one of them.

##### 1. Retinyl Esters

These molecules take about three steps to convert into the final product- Retinoic Acid, once it is absorbed by your skin. This is why it has less intensity. The most common form of Retinyl Ester

that you may spot on the ingredient list is Retinyl Palmitate. You can also consume it in Vitamin supplements.

##### 2. Retinol

This one takes only two steps to turn into Retinoic Acid. It first turns into Retinaldehyde and then Retinoic Acid. This one is widely used in OTC since it shows effects in a reasonable period and is comparatively safe to use. It is generally available in different strengths - 0.025, 0.25, 0.5 and 1%. Start with the lowest after patch testing.

### 3. Retinaldehyde or Retinal

This is a strong form of Retinoid since it is converted to Retinoic Acid in just one step. This is generally used only after prescription since it is strong. You don't really want to play with this without a word with your dermatologist.

### 4. Retinoic Acid

This is the active form of Vitamin A which is best not put on skin directly.

There are many other synthetic forms of Retinoid with the advancement in cosmeceuticals. Some of the available forms are Adapalene, Tazarotene, Tretinoin (also known as Retin-A), and Isotretinoin (also known as Accutane). These are all to be used only after consulting a doctor since they are of prescription strength.

### What Is The Right Way To Use Retinol? <sup>(9)</sup>

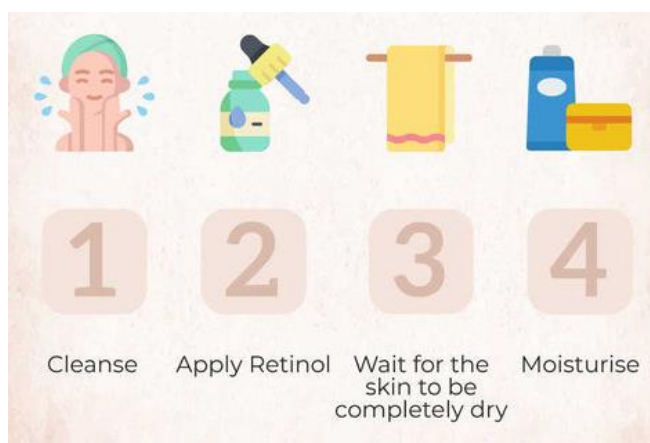


Fig. 7: Right ways to use retinol

#### 1. Cleanse

Make sure you're taking off the day's gunk every day from your face before starting your skincare routine. Pick something that will help you gently exfoliate so that your skincare can sink in better.

#### 2. Wait for the skin to be completely dry

Yes, very important. We can't stress this enough but your skin needs to dry. Not even one drop of water and not even damp skin. We need it to be dry. So wash your face, pat dry it, and wait for 5 minutes before applying Retinol.

#### 3. Apply Retinol

There are pointers to remember before you apply Retinol, folks. Number one is to apply it in tiny drops on your cheeks, chin, forehead, and nose. And yes, tiny drops only.

#### 4. Number two is don't apply it every night

If you've just begun with it then apply it twice a week. After 2 months, build it to thrice a week. You may experience redness and peeling in this duration but that only means that it is working.

Once your skin settles, you can use it every alternate night. Using it every night is a big no-no.

#### 5. Moisturise

Retinol activities may use up the moisture in your skin and make it dry. Dry is never good because that means a compromised skin barrier. So make sure to apply a generous amount of moisturiser right after. If you're of dry skin type, you can apply moisturiser right after washing your face. Apply Retinol over it and then seal it all with another layer of moisturiser on top of it. This moisture sandwich method works well for sensitive skin and beginners too.

#### When should retinol and its derivatives be used with caution (or avoided)?

Because of its known potential irritation, retinol should be avoided in skin care products for those with sensitive skin, as well as babies and children. It has significant skin renewal performance, so it should also be avoided in sun care products, but is suitable in after sun products where there is no sun exposure.



Because it can be toxic in high quantities when ingested, it should not be used in lip care products where incidental ingestion could be significant over the course of a day.

## CONCLUSION

In conclusion, retinol stands out as a powerful ingredient in skincare, offering a wide range of benefits from reducing fine lines and wrinkles to improving skin texture and tone. Its ability to stimulate collagen production and accelerate cell turnover makes it a go-to for many individuals seeking to combat signs of aging and acne. However, its use should be carefully managed due to potential skin irritation, necessitating gradual introduction and proper sun protection. Overall, when used correctly, retinol can be a transformative addition to any skincare routine, offering long-term results for a healthier, more youthful complexion.

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