



## **The effect of zinc oxide in treatment and skin care**

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### **Abstract**

Zinc oxide is an inorganic compound with the formula  $ZnO$ . It is a white powder which is insoluble in water.  $ZnO$  is used as an additive in various substances and products such as cosmetics, food supplements, rubbers, plastics, ceramics, glass, cement, lubricants, paints, sunscreens, ointments, adhesives, sealants, pigments, foods, batteries, ferrites, fireplace retardants, semiconductors, it, and first-aid tapes. Although it takes place naturally as the mineral zincite, most zinc oxide is produced synthetically. Zinc oxide is used for its many homes and applications, as a UV filter in sunscreen (in the shape of nano zinc oxide), as an agent to soothe pores and skin and ease irritation, and as a white pigment in some make-up merchandise such as foundation. Zinc oxide is accused of inflicting undesirable results when utilized on broken skin, and of impacting the aquatic environment. Extensive reviews have been performed on the security of zinc oxide used in cosmetics and as a sunscreen. They exhibit that zinc oxide can be safely used in cosmetics.

**Key Words:** zinc oxide, synthesis, Antibacterial, skincare, treatment

### **1. Introduction**

When it comes to skincare, it is vital to select components that provide each effectiveness and safety. One such ingredient that has won recognition in recent years is zinc oxide. Widely recognized for its use in sunscreen,

zinc oxide gives a vary of advantages for the pores and skin past solar protection. In this complete guide, we will discover the chemistry, properties, and a variety of advantages of zinc oxide for skincare. We will additionally talk about conceivable aspect effects, how to

use it on the skin, and grant choices for these in search of one-of-a-kind options.

Zinc oxide is a white, powdery mineral compound that occurs naturally as the mineral zincite. Chemically, it is made up of zinc atoms bonded with oxygen atoms. It is commonly used in skincare products due to its unique properties.

Zinc oxide provides protection against both UVA and UVB rays, making it an effective sunscreen ingredient. It forms a physical barrier on the skin's surface, reflecting and scattering harmful UV radiation [10,26].

Zinc oxide's soothing houses make it advantageous in relieving rashes, irritations, and itching related with stipulations like eczema, dermatitis, and diaper rash. Its varieties a shielding barrier on the skin's surface, stopping similarly inflammation and permitting the pores and skin to heal. Zinc oxide has herbal antibacterial and anti-inflammatory residences that make it advantageous in treating acne. It helps manage extra oil production, reduces inflammation, and kills acne-causing bacteria. It can additionally promote wound restoration and decrease scarring related to pimple breakouts [12,15].

Zinc oxide is typically regarded secure for most men and women and hardly ever motives unfavorable reactions. However, some human beings may additionally journey minor aspect effects, including:

**White Cast:** Zinc oxide can go away a white residue on the skin, mainly when used in excessive concentrations. This is extra substantive on darker pores and skin tones.

**Dryness and Tightness:** In some cases, zinc oxide can reason dryness and tightness, especially when used in massive quantities or on already dry skin. It is vital to moisturize the pores and skin correctly when the usage of merchandise containing zinc oxide.

#### **How to Use Zinc Oxide on Skin**

To make the most of zinc oxide's benefits, comply with these steps:

**Cleanse your skin:** Start with a mild purifier to get rid of dirt, oil, and impurities from the skin.

**Apply a moisturizer:** Hydrate your pores and skin with an appropriate moisturizer to create an easy base.

**Choose a product with zinc oxide:** Look for skincare products that include zinc oxide, such as sunscreens, moisturizers, or topical creams. **Apply and unfold evenly:** Take a gorgeous quantity of the product and observe it to the skin. Ensure even insurance on all uncovered areas. **Reapply as needed:** If the use of a sunscreen, reapply each two hours or greater often if swimming or sweating.

In this article, we will Talk about the effective role of zinc oxide in the field of skin care and treatment. also, present our product consisting of zinc oxide as the primary component and the rest of its components that make it very special for use. Together we will recognise the features of kemet cream ( barrier cream and burn cream ), its ingredients, its preparation, the reasons for its use, and the side effects it can have in addition to its inexpensive price.

## **2. The Theoretical Framework**

### **Historical grasp on zinc oxide**

Zinc oxide used to be first developed with the resource of the Romans in 2,000 BC. It used to be then synthesized by using way of the Indians in the sixteenth century, in China in the seventeenth century, and in Europe in 1850. It used to be first used as a watercolor and diluent in paints and in the late Eighteen Nineties in the schooling of oil paints. In 1970, it used to be as soon as used to make photocopy paper and to decorate paper quality. Most cutting-edge scientific lookups have established on ZnO as a semiconductor material. The search for records about the homes of ZnO commenced in 1912, at the equal time as the enchancement of semi-

conductors, after the invention of the transistor. In 1960, remarkably captivating piezoelectric residences of ZnO had been discovered, which led to the first software program of electronics as a skinny layer in ground sound wave components. Since 1990, search for ZnO has accelerated dramatically, specifically in medicinal drug and cosmetics. Medicinal use.

In treatment and health, this compound acknowledged as zinc oxide is used in baby powder, pores and pores and skin ointments, sunscreen, anti-dandruff shampoo and Zinc oxide ointment is used in the remedy of pores and pores and skin lesions inclined to illness such as burns, eczema, child foot burns, scratches, and insect bites. It is used for moderate pores and pores and skin contamination and in combination with calamine as an anti-itch.

Zinc oxide has moisturizing, antibiotic, and deodorant properties. It is moreover used in the composition of sunscreens due to its anti-sebum and UV reflecting effects.

Cosmetic uses Zinc oxide has many makes use of in the cosmetics industry. This compound can soak up the sun's UV rays and shield the pores and pores and skin from sunburn and exceptional UV damage. Zinc oxide is one of the most quintessential components of mineral cosmetics. Because zinc oxide is now not absorbed by using the skin, it does now not reason any pores and pores and skin hypersensitive reactions and is non-allergenic and non-irritating.

It is moreover used in producing deodorants and soaps. This mixture helps to dispose of physique scent and prevent the increase of bacteria, and accurate relieves any pores and pores and skin allergies.

Several investigations (About 161 articles) have been carried out to look at efficacy of zinc as a treatment modality for zits vulgaris. Inclusion Criteria includes : Studies ought to barring lengthen include subjects with at least average acne.

- Studies need to use a human model.
- Studies want to use topical or oral zinc formulations.

For each and every study, we file on the sample size, diploma of disease, dosing protocols, study about length, follow-up periods, poor effects, final result measures, and results. Treatments containing totally zinc are referred to as "single-agent products," whereas the redress containing zinc in addition to a number of elements are referred to as "combination products." Furthermore, we file on the lookup evaluating zinc to distinctive treatment modalities, such as clindamycin and erythromycin. Quantitative and qualitative assessments of zits lesions have been used by way of most studies. The lookup that used zinc as a single agent remedy the lookup that use zinc in a combination redress determined out about that in distinction zinc with distinctive treatment companies. [7].

### 3. Methods of Research and the tools used

We use zinc oxide from (zochem) and its purity is 99.9%

#### Zinc oxide cream.

Zinc oxide is the traditional ingredient in many skin-care products, which include sunscreens, diaper creams, and different barrier creams. Barrier lotions guard the pores and skin from exterior irritants like moisture, friction, and contact with hazardous substances. Zinc oxide is specifically positive in developing a bodily barrier on the pores and skin that can assist to forestall moisture loss and limit the chance of pores and skin inflammation and inflammation. While zinc oxide is regularly used in barrier creams, it is essential to word that now not all merchandise containing zinc oxide is designed for barrier protection. For example, some zinc oxide-containing sunscreens are formulated notably for UV safety and might also now not grant the identical degree of

barrier safety as a diaper cream or different specially designed barrier cream.

### What is Barrier Cream?

A barrier cream protects the pores and skin from exterior irritants and damage. Barrier lotions structure a protective layer on the pores and skin that protects in opposition to water, chemicals, and different irritants. They are normally used in the healthcare enterprise to defend the pores and skin of healthcare employees who contain quite a few chemicals, and human beings with touchy or broken pores and skin additionally use them. Barrier lotions are made with occlusive ingredients, forming a bodily barrier on the skin. These elements can encompass petroleum, mineral oil, dimethicone, and different sorts of oils and waxes.

### How Does Zinc Oxide Work?

Zinc oxide is a naturally taking place mineral frequently used in skincare and non-public care products. When utilized to the skin, its varieties a bodily barrier that displays and scatters ultraviolet (UV) radiation, which helps to defend the pores and skin from the detrimental results of the sun. Zinc oxide

is viewed as a broad-spectrum sunscreen, which protects against UVA and UVB radiation. figure(1)

In addition to its sun-protective properties, zinc oxide has anti-inflammatory and soothing properties. It is regularly used to assist calm and soothe annoyed or infected skin, making it a famous ingredient in merchandise designed for human beings with touchy or acne-prone skin. Moreover, Zinc oxide is a white powder that is insoluble in water and oils, which makes it a best ingredient for use in water resistant and long-lasting sunscreens. It additionally has astringent properties, which can potentially assist manipulate extra oil manufacturing in the skin, making it beneficial in treating acne. One of the key advantages of zinc oxide is its security profile. Unlike some chemical sunscreens, zinc oxide is now not absorbed into the skin, so it no longer enters the bloodstream or reason systemic facet effects. It is additionally non-irritating and nonallergenic, which makes it appropriate for use on even the touchiest pores and skin.

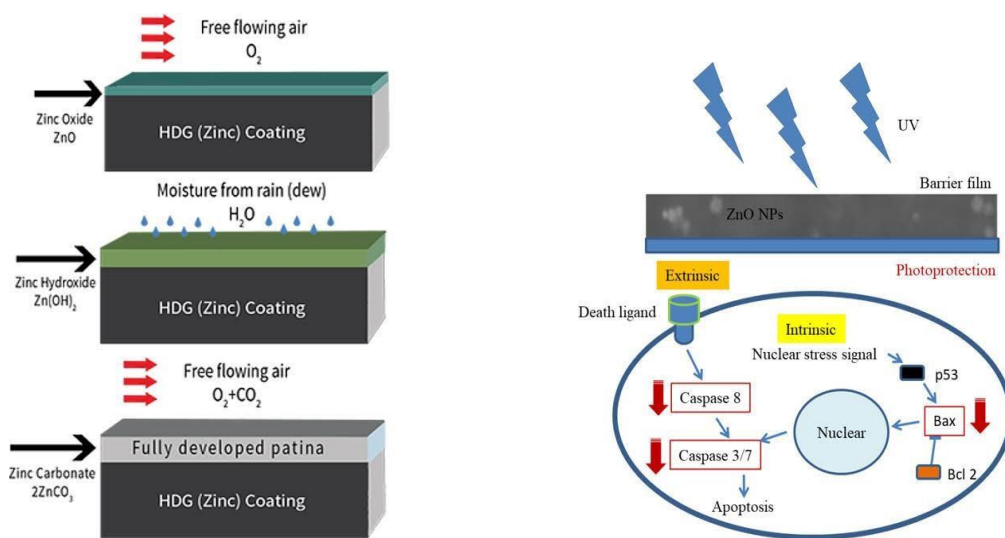


Figure (1) explain How Does Zinc Oxide Work?

### Zinc oxide 10% burn cream

The latest record from the World Health Organization (WHO) estimates a hundred and eighty zero deaths per 12 months because of burn accidents with most taking place in low- and middle-income countries. The damages induced with the aid of burns are painful and can drastically compromise the integrity and shielding feature of the pores and skin and set up an unsafe avenue for infections main to the delayed and restoration process. The gold popular for remedy of burn accidents is to use autografts. However, the constrained pores and skin donor web-sites and excessive chance of contamination prevent their applications. Traditional dressings, e.g., gauze and cotton wool besides bioactive elements are used in clinics as a usual way to cowl the wound. Unfortunately, this methodology no longer has superb results on accelerating the wound restoration process. As such, current efforts have been targeted on designing superior dressings containing stem cells, antibiotics, and bioactive molecules that facilitate wound regeneration.

An Ideal wound dressing must soak up wound exudates, grant thermal insulation and mechanical safety to the wound, stop bacterial colonization, enable fuel and nutrient transportation, and decrease the nearby irritation response. Different techniques are developed to fabricate superior wound dressings, consisting of the use of fabric methods, hydrogel sheets, and electrospinning. Electrospinning is a simple, cost-effective, and effective approach for fabricating polymeric nanofibers with specific structures, inclusive of porous, hallow, or core-shell fibers. Core-shell electro spun nanofibers in contrast to the single shape nanofibers have received extra recognition as they allow handing over more than one bioactive molecule with one-of-a-

kind launch kinetics, heading off any harm of loaded drug from extreme environments through incorporation of drug in core, allow sustained launch for longer time duration alongside with minimizing the burst release, and most effective mechanical properties.

It's observed that Burn accidents characterize a main life-threatening tournament that affects the first-rate of lifestyles of patients, and locations full-size needs on the world healthcare systems. This learns about introduces the fabrication and characterization of a novel wound dressing made of core-shell hyaluronic acid-silk fibroin/zinc oxide (ZnO) nanofibers for remedy of burn injuries [13]. The core-shell configuration permits loading ZnO-an antibacterial agent-in the core of nanofibers, which in return improves the sustained launch of the drug and continues its bioactivity [16]. The administration of zinc in dietary doses multiplied the plasma zinc degree in burn sufferers to round regular manage degrees and accelerated the antioxidant status, as represented through elevation of the herbal antioxidant degree (glutathione), in addition to recuperation time, the incidence of eschar formation, and the mortality rate, in contrast with the zinc-Non supplemented group. We conclude that dietary zinc supplementation in zinc-deficient burn sufferers led to excellent enhancements in their effect and that zinc deficiency used to be as a necessary aim to goal during treatment; also, that the use of an aggregate of topical and systemic antioxidants (povidone iodine ointment and zinc sulphate, respectively) represented a suitable method for enhancing effects in burn affected person treatment. So, the use of Zinc oxide assists in burn recuperation in precise step.figure(2)



figure (2) This figure shows step of healing  
To improve this operation, we just used anther components

**Hyaluronic acid ( $C_{14}H_{21}NO_{11}$ )<sub>n</sub> figure(3)**



Figure (3) represent Hyaluronic acid.

**A naturally occurring glycosaminoglycan was found throughout the body's connective tissue.**

Hyaluronic acid is a linear polysaccharide of the repeating disaccharide unit consisting of a glucuronic acid and N-acetyl-D-glucosamine moiety that are linked by using alternating  $\beta$  1–3 and  $\beta$  1–4 glycosidic bonds. It is a glycosaminoglycan, which is in the extracellular matrix of connective and epithelial tissues. Hyaluronic acid is one of the materials of the floor substance that embeds the fibrous factors and cells of the dermis of skin, though it is additionally observed in the epidermis. In fact, whilst hyaluronic acid is observed for the duration of the body, most of it is in pores and skin the place it is synthesized via fibroblast cells.<sup>1</sup> It ought to be pointed out that hyaluronic acid is the most plentiful glycosaminoglycan discovered in the dermis. In general, glycosaminoglycans structure a fluid matrix via binding with giant portions of water permitting the dermis to continue to be hydrated and additionally preserve physically induced exterior pressures ensuing in the transformation from a strong to liquid phase.<sup>2</sup> In fact, hyaluronic acid can bind up to 1,000 instances its weight in water. Typically, it has a very excessive molecular mass of tens of millions of Daltons.

In addition to naturally forming a critical phase of the dermis structure, hyaluronic acid is additionally used in pores and skin treatments. Taking benefit of its hydration properties, hyaluronic acid is many times discovered in moisturizing formulations. It must be stated that its characteristic relies upon climatic conditions. For example, in dry surroundings topically utilized hyaluronic acid will tend to bind with water already current in the skin, thereby inflicting dehydration of the skin. In extra humid

conditions, hyaluronic acid binds with water from the exterior surroundings and hydrates the skin. In any event, it is usually advocated to formulate hyaluronic acid with occlusive agents [25]. in folks with dry skin. Native hyaluronic acid (linear structure of the polysaccharide) solely lasts a very brief time after injection into pores and skin earlier than it turns into diluted and undergoes enzymatic degradation in the liver. Therefore, hyaluronic acid used in fillers is crosslinked thereby growing a water-insoluble gel that is steady for a length of various months in the ski The diploma of cross-linking results the rheological houses of the gel as properly as its swelling behavior. Hyaluronic acid additionally has anti-inflammatory and wound recovery properties. Present in the decrease layers of the epidermis, innovative scientific proof factors to a regulatory and modulatory function via hyaluronic acid in which it binds with proteins and cellphone floor receptors [17]. Until recently, hyaluronic acid used to be the idea of simply a massive hydrophilic polysaccharide of the dermis that absorbs water and contributes to the mechanical residences of skin. Now, researchers are beginning to unveil a wide variety of necessary organic features performed via this molecule in pores and skin homeostasis [31].figure(4)

**Note that.**

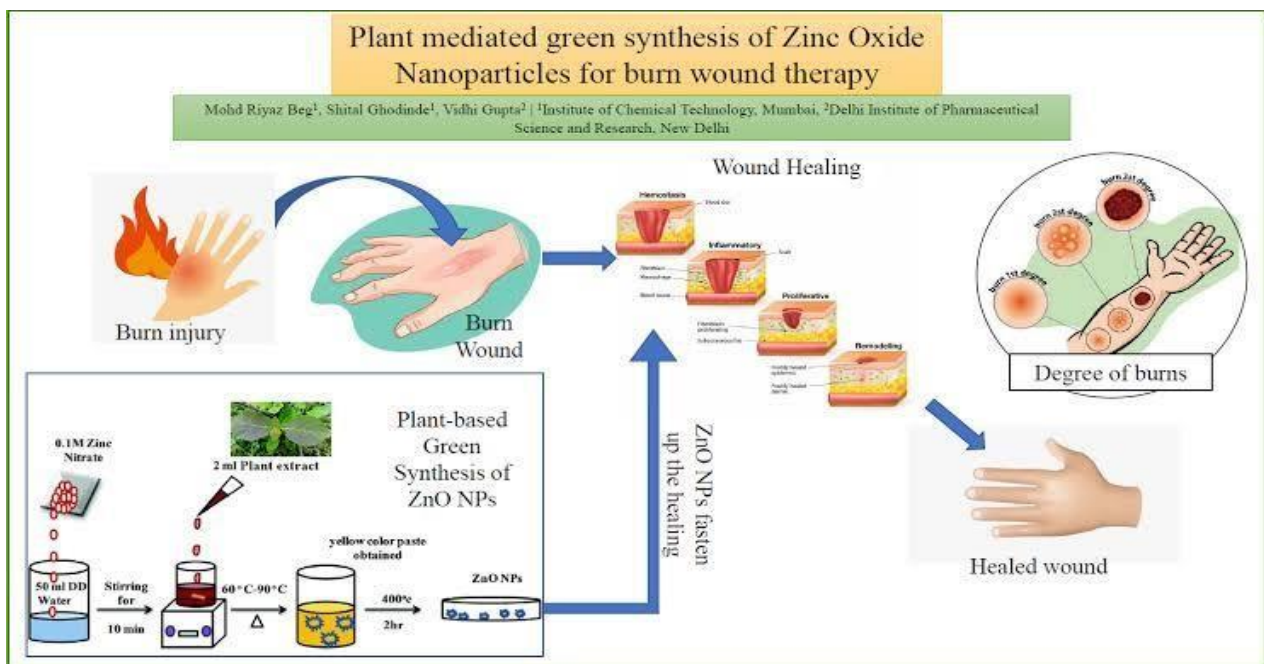
You will want to avoid products with more than 1.5% percent HA to avoid irritation or dryness.

**How do they work together for burn?**

. It was found that the addition of zinc salts improved the absorption, antibacterial, tensile, and gelation properties of hyaluronic acid fibers.

So, we used excess zinc oxide to HA [2,3,4,11,14,20,21,24].





**Figure (4)** shows the role of zinc oxide in medical field (Burn wound therapy)

#### 4. Results of Research

Zinc is an inexpensive, over-the-counter mineral with a well-established security profile. Limited research has cautioned that it is high-quality in treating pimples vulgaris, however numerous find out about sketch boundaries want to be addressed earlier than zinc is extensively added as a choice or adjunct remedy in the scientific setting.

Given the small pattern size, quick follow-up durations and lack of standardization in most of the research reviewed, extra large-scale double-blind, randomized managed research are wanted to decide the most useful therapy routine for excessive efficacy of zinc in zits vulgaris. Advantages of zinc oxide cream.

Usually, zinc oxide is a safe ingredient used in cosmetics. It is used in several over-the-counter skin protectants and sunscreen drug products. However, it is best to conduct a 2.A Moisture

patch test on your skin before using any skin care products. When used to treat wounds or other skin conditions, do consult your doctor first in cosmetics?

#### A. For skin figure (5)

##### 1.A. Protects Skin from Sun Damage

Researchers have found that zinc has herbal sun-protection benefits. When your pores and skin are stuffed with a prosperous layer of zinc oxide, it displays and absorbs the UVA and UVB rays. This way it blocks the hazardous rays from coming into your skin. However, the efficacy of this ingredient absolutely relies upon its concentration. Various merchandise uses exceptional percentages of zinc oxide which is why the impact varies. The extra zinc oxide is on your skin, the longer it is covered from solar damage. Usually, sunscreens incorporate 25% to 30% zinc oxide [13].



As zinc oxide creates a protecting barrier on the skin's surface, it can additionally assist maintain the pores and skin hydrated and moisturized. This is due to the fact it prevents TEWL or water loss from the pores and skin to the environment. This is specifically vital as we age as the skin's natural potential to alter moisture decreases [8,28].

### 3.A Irritation

Due to its capacity to soothe pores and skin irritation, zinc oxide is frequently used for its capability to calm and soothe annoyed or reactive skin. You may additionally see zinc used as an active ingredient in anti-dandruff shampoos, to forestall dry flaky pores and skin on the scalp, in zits merchandise and in formulations designed for touchy skin [19,30].

### 4.A Controls Excess Oil

Zinc oxide works as an astringent when you practice it topically. It controls the oil formation below your pores and skin and prevents extra oil from being produced. Thus, these with oily pores and skin sorts can gain from topical zinc oxide. Reducing oil formation also helps preserve the oil balance, hence reducing the danger of zits breakouts [6].

### 5.A Treats Acne

Studies have proven that the anti-inflammatory residences of zinc make it useful to deal with inflammatory pores and skin conditions. It is typically blended with different antibacterial retailers that collectively assist to limit pain, severity, and look of pimples breakouts. Moreover, the lookup states

that topical use of zinc oxide by myself or in aggregate with several factors can be wonderful to minimize. acne bacteria [19].

## **B. for hair**

Most people are familiar with the use of zinc oxide as a topical application for skin irritations and burns. Meanwhile, they are rarely aware that zinc oxide also works as an ingredient in shampoo that provides a variety of benefits. Here we will discuss 7 key benefits of using zinc oxide in shampoo.

Treat and prevent dandruff.

Soothe dry, itchy scalp.

Reduce scalp odor.

Promote healthy hair growth.

Prevent hair loss.

Make the hair look and feel healthier.

Zinc shampoo is recommended by specialists.

Zinc oxide works by adsorbing to the surface of the skin or scalp, where it actively blocks UVA and UVB radiation from reaching the skin. This helps prevent sunburn, skin cancer, and premature aging of the skin.

## **C. in Medical field**

### 1.C Improves Healing of Skin

Zinc has an herbal potential to heal wounds. People who are struggling from wounds or pores and skin harm like sunburn, tenderness etc. can matter on the use of topical zinc oxide. It will heal the pores and skin from inside and soothe it. On the contrary, deficiency of zinc has been linked to slower wound healing figure(6).



Figure (5) role of zinc oxide for skin

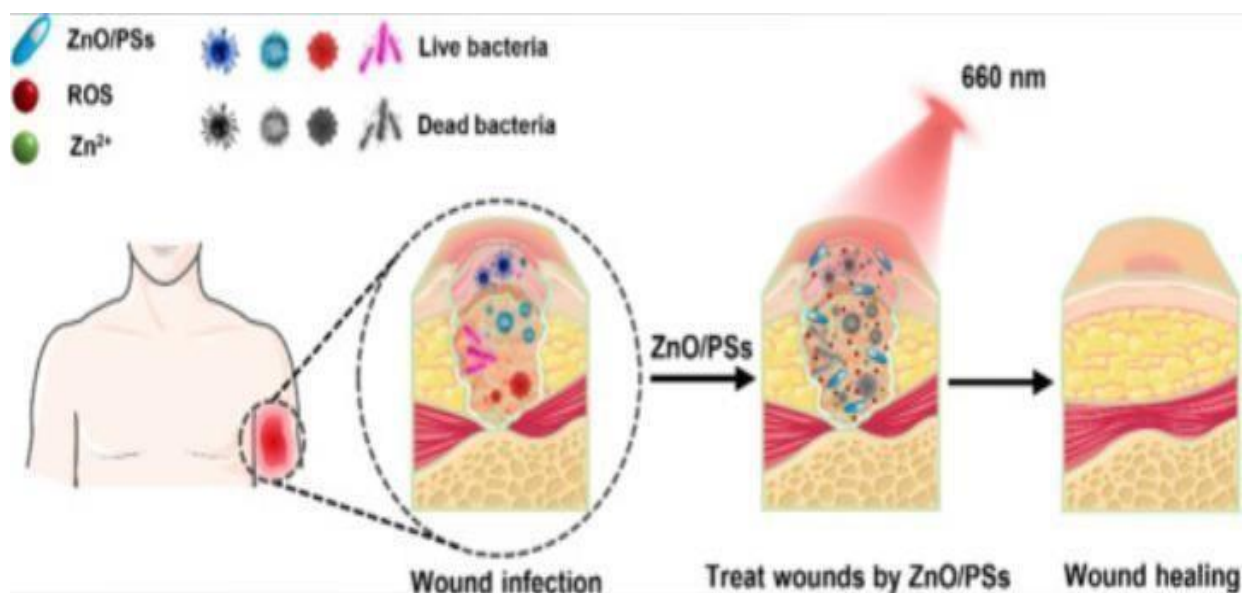


Figure (6) Healing wounds

2.C Prevents Bacterial Infection

As referred to earlier, zinc oxide is antimicrobial, anti-inflammatory and can heal wounds. All these characteristics assist zinc oxide

to decrease the possibilities of bacterial infection. A 2003 find out about suggests that zinc oxide decreases the chance of creating bacterial contamination by means of stopping the internalization of the bacteria.

### 3.C Anti-aging.

Zinc oxide may additionally have advantages for anti-aging. As mentioned, it helps to forestall water loss from the skin, which is essential to getting older skin. As we age, the pores and skin slowly reduce the herbal oils that it produces, decreasing the skin's potential to entice moisture in the skin. The defensive skills of zinc oxide assist to preserve that moisture in. The different way that zinc oxide can also assist with ageing is thru zinc's conceivable capability to act as an enzyme cofactor or helper molecule in the procedure of DNA restore and collagen synthesis. While this property of zinc is no longer wholly explored in the lookup it is a fascinating achievable advantage

#### **Side effects of zinc oxide and precautions:**

Zinc oxide is believed to be non-allergenic and non-comedogenic, which capability it does now no longer clog the pores or irritate the skin. It is seen as tightly closed to use. However, the compound can purpose allergic reactions such as swelling, itching, or tingling in some people. People with sensitive pores and pores and skin or these who have any allergic inclinations ought to take a look at with

their clinical medical doctor first beforehand than the use of some thing that has zinc oxide.

Zinc oxide can assemble up in your physique over time and may additionally moreover be pushed over the threshold with the aid of the usage of a cream or unique specialist pores and pores and skin care product that contains this ingredient. This is why it is necessary to continuously are seeking for recommendation from your scientific medical doctor or professional in the past than taking any extra zinc complement or the utilization of an immoderate interest zinc topical product.

Many victims do now not apprehend that aspects placed on the pores and pores and skin can regularly be absorbed into the physique and are no longer usually cycled out quickly.

If you are pregnant or lactating, please are trying to find recommendation from your medical doctor previously than the utilization of any product with zinc oxide [1,5,9,23].

#### **Formula**

Table (1) illustrate the formula of barrier cream

Table (2) illustrate the formula of burns cream

**Table (1) Formula of barrier cream**

Ingredients	%	Justification of Use
<b>*Oil phase</b>		
Stearic Acid	6%	A key component of corneum lipids, an antioxidant and also potent anti-inflammatory lipid, non-toxic and non-irritant [22,29].
Cetostearyl Alcohol	3%	It is used as an emulsion stabilizer, pacifying agent, and foam boosting surfactant, as well as an aqueous and non-aqueous viscosity-increasing agent [32].
Mineral Oil	7%	Mineral oil has been shown to improve skin softness and barrier function better than some other emollients. Benefits skin through hydration and occlusion [27].
<b>*Water phase</b>		
water	69%	
ZnO	4%	Mentioned before
Glycerin	5%	Humectant/Emollient
Triethanolamine	1%	A surfactant or pH adjuster, alkalizing agent; emulsifying agent
<b>*Cool down phase</b>		
Vitamin E	1%	fat-soluble antioxidant, it protects the skin from various deleterious effects due to solar radiation
Preservative	1%	
panthenol	2%	A humectant meaning it holds and binds water, and these properties mean that it is ideal when it comes to keeping water in the skin. It also works as an emollient which means it can moisturize and soothe the skin, as well as help, protect it from environmental factors
HA	1%	Mentioned before

**Table (2) Formula of burns cream**

Ingredients	%	Justification of Use
<b>*Oil phase</b>		
Stearic Acid	6%	A key component of corneum lipids, an antioxidant and also potent anti-inflammatory lipid, non-toxic and non-irritant [22,29].
Cetostearyl Alcohol	3%	It is used as an emulsion stabilizer, pacifying agent, and foam boosting surfactant, as well as an aqueous and non-aqueous viscosity-increasing agent [32].
Mineral Oil	7%	Mineral oil has been shown to improve skin softness and barrier function better than some other emollients. Benefits skin through hydration and occlusion [27].
<b>*Water phase</b>		
water	65.5%	
ZnO	10%	Mentioned before
Glycerin	5%	Humectant/Emollient
Triethanolamine	1%	A surfactant or pH adjuster, alkalizing agent; emulsifying agent
<b>*Cool down phase</b>		
Preservative	1%	
HA	1.5%	Mentioned before

## Steps

- We add oil phase together in water path until it melts.
- At the same time we add water phase together in water path and mix it until it mixed well,
- Then we add water and oil phases together and mix them to be homogeneous mixture.
- we leave the mixture until it cools and add cool dawn phase and mix them well



<https://drive.google.com/file/d/1kaq78Dy4qjDs0Wl7ipmH14UUqb0iYkhk/view?usp=drivesdk>

## 5. Interpretation of Results

At end of our research, we show a little benefits of zinc oxide this material has a significant effect in our life from infant to adults we hope to work increasingly on this compound in our local products.

## 6. Conclusion

Zinc is an inexpensive, over-the-counter mineral with a well-established safety profile. Limited studies have suggested that it is effective in treating acne vulgaris, but several study design limitations need to be addressed before zinc is widely introduced as an alternative or adjunct treatment in the clinical setting. Given the small sample size, short follow-up periods and lack of standardization in most of the studies reviewed, additional

large-scale double-blind, randomized controlled studies are needed to determine the optimal treatment regimen for high efficacy of zinc in acne vulgaris.

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