

## Current Situation and Future Development of Acne Treatment Research

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**Abstract:** As a common adolescent facial disease, whelk is recognized by medical science as a kind of facial skin epidermis and pore epidermal keratosis. The pathogenesis is the complete and incomplete blockage of pores, which leads to the abnormal excretion function of normal pores, the retention of fat overflow excrement in pores, the formation of black head, white head acne and fat particles, and the black head and white head acne combined with infection and acne. For whelk, although its occurrence has long been clear, but the treatment is still a worldwide problem. This paper summarizes the current treatment methods and measures for acne in the world. The common points of various treatment methods and measures are local anti-infection and systemic conditioning treatment, but the results are the same, ineffective treatment. The Chinese skin and children's association concluded in the prediction of the acne market survey report 2014-2020 that China is one of the countries with the highest incidence of acne in the world, and the products for acne treatment in China focus on traditional Chinese medicine, plant extract oil, etc., which has not proved any effective products for acne treatment. Common ills and acne removing products in the world, is the product of sugar, lipid and protein such as due to the needs of the manufacturing process, however, in the treatment, not only the realization of the effective treatment of acne, and paste products contain sugar, lipid and protein substances, promoted the complete and not completely blocked pores, treatment also aggravate the occurrence and development of the acne. In this paper, the author thinks that from the growth of the facial skin cell metabolism, change from regulating the growth of biological cells, in does not affect the biological cell function, through the adjustment and change of biological cell growth, make pore jams not, went up from the fundamental to realize the treatment of acne, is the current medicine, biologists face and need to study and subject to be solved.

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### 1. Introduction:

As we all know, open the history of each country in the world, look at the history of each country in the life of the emperors, there is a common characteristic, once ruled a country, are looking for the discovery of talent, smart, intelligent experts and scholars, to help the emperor to find immortal elixir. In fact, it is not only the emperor who seeks immortality. But years and generations have passed, and no one has discovered that there is any medicine or measure to make people immortal. Until 1938, was first isolated from bovine erythrocyte Superoxide Dismutase (SOD), and to rediscover the protein, such as 1969 McCord found their biological activity, and make clear its catalytic properties of ultra-oxygen anion disproportionation reaction, formally named Superoxide Dismutase (SOD, EC1.15.1.1) makes the human study forever a leap in the history of life science. The discovery of SOD makes it possible for human beings to hope to live forever. Regardless of whether or not can achieve immortality, however, the discovery of SOD, prolong the life of human is

possible, the important factor is the scientific research has proved that human disease and aging, happens with Free radicals (Free radical) is associated with increased in the body, and SOD is a natural Free radical scavenger, Free radicals are cleared, or the amount of Free radicals in the body, can decrease the occurrence of diseases, This is why the discovery of SOD is a major breakthrough and revolution in the study of human immortality. SOD scavenges the free radicals that cause diseases, which will certainly make the human body healthy and prolong life. This paper aims to comprehensively expound the role and mechanism of SOD in human health.

### 2. Overview of treatments for acne

#### 2.1. Topical Acne Treatment:

Topical use of antibiotics is currently a widely accepted effective and safe treatment for acne. A review of the articles published in the past 30 years revealed that topical application of antibiotics such as erythromycin, clindamycin or tetracycline showed clinical effectiveness for mild to moderate

inflammatory acne, especially when they are combined with zinc, tretinoin or benzoyl peroxide, while they showed little influence on noninflammatory acne. The main mechanism of action of topical antibiotics for acne treatment is inhibition of inflammation caused by bacteria rather than a direct bactericidal effect. The adverse reactions of topical antibiotics are mostly minor and negligible, while special attention should be given to the risk of development of resistant strains of *Propionibacterium* acnes. The development of new antibiotics is promising and will provide a wider range of therapeutic options for refractory cases.

### 2.2. Hormonal Treatment of Acne:

Acne is a common skin disease associated with many factors. Although it is mainly simple, it may also be high androgen and hormone differences. It is important to note that hormone therapy is appropriate for severe, treatment-resistant cases, as well as for monthly episodes when standard treatment is not appropriate. This as an updated hormonal pathogenesis of acne treatment, discusses endocrine assessment based on suspected hormonal acne in patients and provides an overview of the current hormonal treatment regimen for women. Resistant strains of *propionibacterium* acnes. The development of new antibiotics has broad prospects and will provide a wider range of treatment options for refractory cases.

### 2.3. Salicylic Acid for the Treatment of Acne:

Most cases of acne vulgaris are either mild or moderate in severity and well-suited for treatment with nonprescription agents that are safe, effective, and convenient to use. A review of four clinical studies and a comedolytic assay attests to the efficacy and safety of 0.5% and 2% solutions of salicylic acid for the treatment of acne vulgaris. In three placebo-controlled studies and a comedolytic assay, salicylic acid pads reduced the number of primary lesions and thereby the number and severity of all lesions associated with acne. Comparative studies of salicylic acid have shown it to be superior to benzoyl peroxide in reducing the total number of acne lesions. Adverse reactions to salicylic acid are generally limited to mild, local irritation occurring in a minority of patients.

Age and history: the first known and confirmed free radical was the triphenyl radical discovered by Moses Grunberg at the University of Michigan in 1900. Chinese organic chemist Youcheng Liu is an academician in the field of free radical chemistry, also made outstanding contributions.

### 2.4. Psychology and radiotherapy:

Although knowledge concerning the dermatological treatment of chronic acne has grown considerably in recent years, relatively few studies

have assessed the impact of effective physical intervention upon the psychoemotional functioning of patients. Hypotheses regarding the psychological impact of acne were developed using concepts drawn from evolutionary psychology. A sample of 34 patients (19 men and 15 women) with chronic acne were assessed for psychological, emotional and dermatological symptomatology using a variety of self-report questionnaires over four time-points during 16 weeks treatment with isotretinoin. Thirty-four patients completed the first assessment, 21 the second, 20 the third and 15 the fourth and final assessment. At the first assessment, prior to isotretinoin treatment, 15 patients (44%) reported clinically significant levels of anxiety, while six patients (18%) reported clinically significant depression. Women with acne were significantly more embarrassed than their male counterparts about their skin disease. Treatment with isotretinoin produced significant improvements across a wide variety of psychological functions, although the emotional status of patients appeared to be more resistant to change. Acne appears to be a condition which has the potential to damage, perhaps even in the long term, the emotional functioning of some patients.

### 2.5. benzoyl peroxide acne treatment;

Concomitant application of 5% w/w benzoyl peroxide and 3% w/w erythromycin has previously been shown to prevent the overgrowth, on the skin of acne patients, of erythromycin - resistant coagulase-negative staphylococci, which occurs when the antibiotic is used alone. Two in vivo studies were carried out to assess the ability of the same therapeutic combination to inhibit the growth of pre-existing erythromycin-resistant *propionibacteria* and to prevent the selection of resistant strains during treatment. A double-blind clinical trial in 37 patients with mild to moderate acne vulgaris showed that the combination brought about a  $> 3 \log_{10}$  c.f.u. reduction in total *propionibacterial* numbers/cm<sup>2</sup> after 6 weeks therapy ( $P < 0.001$ , Wilcoxon's matched pairs) and also significantly reduced the number of erythromycin - resistant *propionibacteria* ( $P < 0.05$ ). In contrast, erythromycin alone reduced the total *propionibacterial* count by  $< 1.5 \log_{10}$  c.f.u./cm<sup>2</sup> after 6 weeks ( $P < 0.05$ ) and did not affect the number of erythromycin - resistant strains. The combined formulation was significantly more effective at reducing total *propionibacterial* numbers at 6 ( $P < 0.01$ , Mann - Whitney) and 12 weeks ( $P < 0.05$ ) than erythromycin alone, although, after 12 weeks, the anti - *propionibacterial* efficacy of both preparations was less marked. Five patients on combination therapy, and five treated with erythromycin alone, acquired erythromycin-resistant

strains de novo at week 6 or week 12. In an open study in 21 acne patients, who each carried > 10<sup>3</sup> c.f.u. erythromycin - resistant propionibacteria/cm<sup>2</sup> skin pretreatment, the combination of erythromycin and benzoyl peroxide reduced the total propionibacterial count by > 2.5 log<sub>10</sub> and the number of erythromycin - resistant strains by a similar amount (P < 0.001, Wilcoxon). This was accompanied by highly significant reductions in acne grade and lesion counts (P < 0.001). These data suggest that the combination of 5% w/w benzoyl peroxide and 3% w/w erythromycin has greater in vivo antipropionibacterial activity than 3% w/w erythromycin alone, and brings about significant clinical improvement in acne patients with high numbers of erythromycin - resistant propionibacterial strains pretreatment.

## 2.6. Antibiotic Resistance in Acne Treatment:

Propionibacterium acnes (P. acnes) is an anaerobic bacteria implicated in the pathogenesis of acne vulgaris. There are four primary pathogenic factors: excess sebum production, bacterial colonization, inflammation, and abnormal keratinization.<sup>1</sup> Treatment targets as many pathogenic factors as possible and may include a combination of topical and systemic agents.

Although current acne guidelines discourage the use of antibiotics as prolonged monotherapy,<sup>1</sup> about 5 million prescriptions for oral antibiotics are written each year for the treatment of acne.<sup>2</sup> Antibiotics demonstrate anti-inflammatory and antimicrobial effects and work on two levels: to decrease the presence of P. acnes – a resident of the normal microflora found in abnormally high numbers in the sebaceous follicles of patients with acne and a primary factor in the development of inflammatory acne<sup>3</sup> – and to inhibit the production of P. acnes-associated inflammatory mediators.<sup>4</sup> Indeed, topical and oral antibiotics have been the mainstay of acne treatment for over 50 years.

In 1976, there was no evidence of antibiotic-resistant propionibacteria on the skin of over 1000 patients with acne.<sup>5</sup> By 1979, Crawford and colleagues had detected the first indication of resistance to topical erythromycin and clindamycin,<sup>6</sup> which was followed by the emergence of tetracycline-resistant P. acnes in the early eighties.<sup>7</sup> Since then, the incidence of antibiotic resistance in acne has continued to rise across the globe, from 20% in 1978 to 72.5% in 1995,<sup>8</sup> with combined resistance to erythromycin and clindamycin more prevalent than resistance to tetracycline.<sup>9</sup> Evidence suggests that it is the use of topical erythromycin and clindamycin – the most commonly used topical antibiotics in acne – that has contributed to the gradual increase in resistance over the last 20 years. In fact, resistant P.

acnes strains have been shown to emerge after only 8 weeks of topical antibiotic monotherapy, with the number of resistant strains increasing progressively over subsequent weeks.

The last 30 years have witnessed an alarming increase in resistance to antibiotics commonly employed to treat acne. Antibiotic resistance in acne represents a significant international public health concern because resistance can occur in more pathogenic bacteria than P. acnes, and an increase in pathogenic P. acnes has been reported. Current treatment guidelines offer strategies to limit the potential for resistance while achieving optimal outcome in the management of inflammatory and non-inflammatory acne. Other things that happen, as you might expect, include fever, heavy use of steroids, or hyperthyroidism, which increases the metabolic rate in the body and produces more free radicals. Industrial gases, pesticides, anesthetic gases and organic solvents in the air outside the body also produce free radicals in the body.

## 2.7. Acne treatment with disorder skin recovery:

A composition is disclosed which when topically applied is effective in the treatment of acne and skin disorders. While the etiology of the treatment is complex, it is believed that the composition reduces the rate of sebum secretion, inhibits the formation of keratin and fatty acids in the pilosebaceous ducts and is antimicrobial to the bacteria normally found in said ducts. The treatment is accomplished quicker and stimulates the production of collagen in the healing of scars if the composition is sonicated into the affected area with ultrasonic vibrations.

This composition relates to a composition for topical administration and to a method of treating acne and skin disorders. Acne is a very common skin disease. It may be defined as a disorder characterized by seborrhea and obstruction of hair follicles with horny accumulations and is often complicated by the development of inflammatory lesions located on the face, neck, shoulders and chest, which include: (1) comedones, (2) whiteheads, (3) papules, (4) pustules, (5) cysts and (6) scars, i.e. (a) ice pick and shallow pock, (b) pits and (c) keloid and hypertropic.

Much work has been done in an attempt to understand the mechanisms of acnegenesis. An interaction between hormones, keratinization, sebum and bacteria somehow determine the course and severity of the disease. Attention has been paid in particular to the factors controlling sebaceous gland secretion and to the bacteriology of acne. Acne begins at puberty, when an increase in androgens causes an increase in the size and activity of the pilosebaceous glands. In statistical terms acne patients have larger sebaceous glands and secrete

more sebum than patients without acne probably because they have an enhanced response to circulating androgens. However, this does not necessarily apply to the individual since some greasy-skinned patients have no acne. The sebaceous glands are small, sacculated, glandular organs lodged in the substance of the dermis. They are found in most parts of the skin, but are especially abundant in the face around the aperture of the nose and mouth. Each gland consists of a single duct more or less capacious, which emerges from a cluster of alveoli. Each alveolus is composed of a transparent basement membrane, enclosing a number of epithelial cells. The outer or marginal cells are continuous with the lining of the duct. The remainder of the alveolus is filled with larger cells, containing lipid, except in the center, where the cells become disintegrated leaving a cavity filled with their debris and with a mass of fatty matter, which constitutes the sebum. The ducts open most frequently into a hair follicle, but occasionally they open upon the surface of the skin as in the free margin of the lips.

When it emerges from the pilosebaceous duct, sebum contains triglycerides, waxes, squalene and fatty acids but as it emerges from the sebaceous gland it contains no fatty acids. While the sebum passes up the pilosebaceous duct, bacterial enzymes break down the triglycerides into free acid. The bacteria responsible for this are primarily *Corynebacterium acnes* and *Staphylococcus aureus*. Thus, the lipids which reach the skin contain not only triglycerides but free fatty acids. Some of the free acids are known to potentiate obstruction of the pilosebaceous duct. Formation of an obstruction in the pilosebaceous duct is an essential step in the pathogenesis of acne. There are two types of obstructions, open comedones and closed comedones. A "blackhead" is an open comedo. With this type of obstruction, the contents of the sebaceous follicle can still escape to the surface and the pilosebaceous duct rarely becomes inflamed. In contrast, those lesions clinically classified as "whiteheads" are closed comedones. When the pilosebaceous duct is obstructed with a closed comedone, the sebaceous gland continues to excrete sebum. Bacteria present in the duct pour out lipases which, as aforementioned, break down the triglycerides into free acids which promote keratinization in the lamellae of the ducts. Eventually, the gland ruptures behind the blockage and liberates sebum into the dermis the most irritating component of which is the fatty acids.

Many treatments for acne have been proposed in the past. Generally speaking, there have been topical methods of treatment, systemic and physical. None of these methods, it is believed

however, are as effective or have the same mode of action as the present invention.

### 3. Overview of acne occurrence and treatment in China

#### 3.1. Overview of the incidence of acne in China:

According to a report on the development trend of acne removing market in China from 2014 to 2020, a joint investigation by dermatology association and China youth federation shows that the incidence of acne in China is on the rise year by year, and more than 80% of people have encountered acne problems of different degrees. The disease is more serious when incidence rate accounts for young people 1/3 above. Among them, 294 million middle school students have acne, 133 million college students have acne, and 127 million office workers over 25 years old have acne. The three major groups have a total of more than 550 million people.

On June 19, 2019, 5588 reported, (<http://www.5588.tv/hufu/2019/6/1517:26:45>) , More than 60 percent of college students have acne problems, according to a survey conducted by China youth net campus news agency on 536 college students nationwide. More than 40 percent of students "acne age" more than 5 years; More than 50 percent of college students were in mild acne condition; More than 70 percent of students had received treatment to reduce acne; More than 80 percent of students worry about acne will make the image worse, but also cause skin health damage, anxiety, low self-esteem, affect school performance.

#### 3.2. Overview of acne products in China:

According to the report on the development trend of China's acne removing market from 2014 to 2020, taking xi 'an as an example, there are 27 acne removing brands or products in xi 'an, but none of them is really effective. Our acne patients are eager for reliable acne removing brands and products with good curative effect. According to 5588 on June 19, 2019; Problems in acne skin care products; Different from professional acne treatment, daily chemical acne treatment products are aimed at a larger national market, but for a long time, China's acne treatment products lack a "strong brand" : acne skin care products in the whole cosmetics industry is a very special category, it belongs to efficacy cosmetics, So far, it does not belong to the special category of cosmetics, so the entry threshold is relatively low. A large number of mixed enterprises have been involved to get a share of the soup. Some products are not even up to standard quality, will cause damage to consumers' skin; In this case, the real quality, in line with consumer needs of the brand or a great opportunity to stand out in the market.

#### 4. Prospect of whelk treatment:

Review of the treatment of acne, although there are a lot of methods and measures, the highlight lies in the local treatment of different methods and measures, and local treatment of different methods and measures outstanding purpose, is antibacterial treatment, can only achieve the treatment of local symptoms, can not fundamentally achieve the treatment of acne.

Chinese acne market products more prominent in traditional Chinese medicine, a variety of plants Extraction of oil, and preparation of need sugar, fat and protein human kind, and the application of these products as a result, not only can realize the treatment of acne, the results of its application, increased the pore jams, aggravate the occurrence and development of acne, also promoted the local bacterial infection is aggravating, aggravating the acne occurrence and development, it is the treatment of acne market needs to be corrected and prevent problems.

The mechanism of whelk occurrence has been very clear, and its root cause is abnormal keratinocytes in facial epidermis and abnormal excrete function of skin pores. Therefore, it is necessary to repair the abnormal keratinocytes in facial epidermis fundamentally and regulate the abnormal excrete function of pore cells.

It is the basic measure and direction to realize the treatment of whelk. From the growth of the facial skin cell metabolism study, change from regulating the growth of biological cells, in does not affect the function of biological cells, through the adjustment and change of biological cell growth, make pore jams not, went up from the fundamental to realize the treatment of acne, is the current medicine, biologists face and need to study and subject to be solved.

#### References:

- Nakamae T, Yamada K, Tsuchida Y, Adachi N, Fujimoto Y. Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis (SAPHO) Syndrome with Destructive Spondylitis: A Case Report. *Spine Surg Relat Res.* 2018 Jul 25;3(3):267-269.
- Gallitano S1, Berson DS: How Acne Bumps Cause the Blues: The Influence of Acne Vulgaris on Self-Esteem. *Int J Womens Dermatol.* 2017 Dec. 6;4(1):12-17
- Hayashi N, Akamatsu H, KKawashima M: Japanese Dermatological Association Guidelines: Guidelines for the treatment of acne vulgaris 2017. *J Dermatol.* 2018 Aug;45(8):898-935.
- Ryskina KL, Goldberg E, Lott B, Hermann D, Barbieri JS, Lipoff JB: The Role of the Physician in Patient Perceptions of Barriers *JAMA Dermatol.* 2018 Apr 1;154(4):456-459. doi:10.1001/jamadermatol.2017.6144.
- Rocha M, Sanudo A, Bagatin E: The effect on acne quality of life of topical azelaic acid 15% gel versus a combined oral contraceptive in adult female acne: A randomized trial. *Dermatoendocrinol.* 2017 Oct 13;9(1):e1361572. doi:10.1080/19381980.2017.1361572. eCollection 2017.
- Sun KL, Chang JM: Special types of folliculitis which should be differentiated from acne. *Dermatoendocrinol.* 2017 Sep 27;9(1):e1356519. doi:10.1080/19381980.2017.1356519. eCollection 2017.
- Stringer T, Nagler A, Orlow SJ1 Oza VS: Clinical evidence for washing and cleansers in acne vulgaris: a systematic review. *J Dermatolog Treat.* 2018 Nov;29(7):688-693. doi: 10.1080/09546634.2018.1442552. Epub 2018 Feb 25.
- Gebauer K: Acne in adolescents.. *Aust Fam Physician.* 2017 Dec;46(12):892-895.
- Connolly D,, Vu HL, Mariwalla K1,, Saedi N1, Acne Scarring-Pathogenesis, Evaluation, and Treatment Options. *J Clin Aesthet Dermatol.* 2017 Sep;10(9):12-23.
- Skaggs RL, Hix E, Huang KE, Feldman SR: Characterization of Patients' Quality of Life and Experience in the Course of Acne Treatment. *Skinmed.* 2017 Dec 1;15(6):431-435.
- Toyoda M. · Morohashi M. An Overview of Topical Antibiotics for Acne Treatment , *Dermatology* 1998;196:130–134.
- Mohamed L Elsaie : Hormonal treatment of acne vulgaris: an update, *Clin Cosmet Investig Dermatol.* 2016; 9:2 , 241–248. Published online 2016 Sep doi:10.2147/CCID.S114830.
- Zander E , Weisman S, Treatment of acne vulgaris with salicylic acid pads. (PMID:1535287), *Clinical Therapeutics* [01 Mar 1992, 14(2):247-253].
- Thiboutot D, Gollnick H, Bettoli V, et al. New insights into the management of acne: an update from the Global Alliance to Improve Outcomes in Acne group. *J Am Acad Dermatol.* 2009 May;60(5 Suppl):S1-50.
- MS Fahim - US Patent 4,372,296, Feb. 8<sup>th</sup>.1983 - Google Patents.
- Nakase K, Hayashi N, Akiyama Y, Aoki S, Noguchi N. Antimicrobial susceptibility and phylogenetic analysis of *Propionibacterium* acnes isolated from acne patients in Japan between 2013 and 2015. *J Dermatol.* 2017 Nov;44(11):1.

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