



## Mini Review

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# Topical Skin Application of Hydrogen Peroxide Solution in the Treatment of Acne Vulgaris. An Update

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Acne Vulgaris is a disease with a high incidence among young people, the aesthetic treatment of which requires the search for drugs suitable for local application and with high skin discoloration efficacy, safety and speed of action when administered once to the site of inflammation. The purpose of this review is to indicate what needs to be changed in the hydrogen peroxide solution so that it acquires the properties of a fast-acting pyolytic, hemolytic, bleaching, and detergent cosmetic product that improves the aesthetic outcome of self-treatment in the home

**Keywords:** Skin; Inflammatory Disease; Antiseptics; Physical-Chemical Properties**Introduction**

Acne vulgaris is an inflammatory skin disease of adolescents, the pathogenesis of which is associated with the microbiological colonization of *Propionibacterium acnes*, manifested by multiple purulent inflammatory foci, the localization of which in the exposed part of the face has a negative psychological impact on young people due to deterioration of the aesthetic condition [1,2]. The treatment of this disease is costly and has not been fully developed [3-5]. Therefore, and taking into account the consequences of self-treatment of acne in the case of lesions of the visible part of the face and the great importance of the aesthetic result, new research aimed at increasing the effectiveness of the aesthetic result of acne treatment is of great importance.

**The Role of Pus and Blood in the Aesthetic State of the Skin in Self-Treated Acne**

In acne, local inflammation of the skin very often transforms into pus-inflammatory foci, which at the beginning of the disease often force a teenager to urgently self-treat [6]. Usually the essence of such self-treatment is to squeeze the contents of pus-inflammatory foci to the outside [7]. As a rule, this creates excessive pressure inside the pus-inflammatory focus, which

causes artificial hyperbaric microtrauma of the surrounding living tissues and removal of the pus mass outward by opening the pustule. However, sometimes it is possible to damage blood vessels and develop external mini bleeding. At the end of such self-treatment, the pus mass, together with a small amount of blood, ends up on the surface of the skin at the site of the "cured" lesion. After a few seconds, the remains of these biological masses dry out and turn into a crust, which covers the "cured" nidus of the local lesion and worsens the aesthetic result of the treatment, as it deteriorates the quality of the skin, including its color. Despite this, there are no universally recognized cosmetic products designed solely for the urgent dissolution, discoloration, and removal of "colored" dry crusts of dried blood and pus [6-8].

**Cosmetic Role of Warm Alkaline Hydrogen Peroxide Solution**

As mentioned above, the aesthetic result of acne Vulgaris treatment largely depends on the "contamination" of the skin at the site of the extruded blackhead by the crust that forms from dried pus and blood after their extrusion from a purulent inflammatory focus. This problem is not solved because the list of generally recognized cosmetic drugs does not contain drugs

that quickly dissolve and discolor spots and crusts of dried pus and blood. In this regard, there is hope that the development of new cosmetic drugs with antiseptic, cleansing, and bleaching properties, available to adolescents for self-treatment at home, may improve the aesthetic outcome of treatment.

A solution of 3-6% hydrogen peroxide is one of the most accessible and safe antiseptic drugs successfully used for about 100 years to treat purulent wounds, skin abrasions and external bleeding [6]. This medicinal solution did not undergo significant changes until the possibility was discovered to dramatically change the mechanism of action of all drugs by purposefully giving them "necessary" physical and chemical properties [10]. In this respect it was shown that heating the solution to +37-+42 °C and adding to it 1.7-10% sodium bicarbonate changes the mechanism of action of hydrogen peroxide solution due to hyperthermia and alkaline activity within pH 7.4 - 8.5. In particular, has been shown that warm alkaline hydrogen peroxide solution (WAHPS) have pyolytic, hemolytic, bleaching, foaming and detergent action (RU Patent No. 2331441, 20.08.2008; RU Patent No. 2360685, 10.07.2009; RU Patent No. 2371532, 27.10.2009; RU Patent No. 2539380, 20.01.2015; RU Patent No. 2631592, 25.09.2017; RU Patent No. 2647371). Due to the updated pharmacological activity the specified upgraded hydrogen peroxide solution was recommended for aesthetic self-treatment of acne in domestic conditions. The sanitizing aesthetic effect is explained by dissolving, discoloring and removing dense masses and dry crusts of pus and blood on the site of acne and wounds due to the non-specific pyolytic, hemolytic, bleaching and washing action of WAHPS when applied topically (RU Patent No 2631593, 25.09.2017; RU Patent No 2653465, 20.05.2018).

### Conclusion

The mechanisms of local action of WAHPS, by which hydrogen peroxide solution quickly dissolves, foams, whitens and removes residues of thick, viscous and dry pus, blood and other biological masses from the skin surface at the acne site, indicates the important role of the physical-chemical properties of hydrogen

peroxide solution and the possibility to optimize with its help the treatment of acne Vulgaris in the future. The fact is that an upgraded hydrogen peroxide solution can improve the aesthetic outcome of self-treatment of acne at home. Understanding the aesthetic role of hydrogen peroxide solution in the treatment of acne Vulgaris may lead to increased search and development of new cosmetic products to treat patients with acne Vulgaris.

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