



## Research Article

## Anti-Acne Activity of Toothpaste – An Emerging Pimple Treatment

Preeti Dharmik\* and Ashok Gomashe

Department of Microbiology, Shivaji Science College, Congress Nagar, Nagpur-440012, Maharashtra, India

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## ABSTRACT

Acne may be treated with a combination of remedies including over-the-counter skin care, acne medications, and chemical or laser procedures. All these treatments are comparatively costlier. Hence in the current study, attempts are being made to search for new and cheaper remedy for acne. Here Anti acne activity of various toothpastes was studied against well proven acne causing microbes viz., *Propionibacterium acne* (n=20) and *Staphylococcus aureus* (n=30). For this purpose 5 different toothpastes viz., Colgate, Close-up, Pepsodent, Miswak and Cholgate visible white were selected and their antimicrobial activity were checked. Among all the toothpastes, Colgate showed promising results. Data from topical applications in human subjects revealed that this treatment is effective only against white headed pimples. Study also concluded that white pastes have more anti acne property than colored pasts or gels. The MIC of Colgate was found to be 1.25g/ml against both the acne causing microbes.

**Key words:** Anti-acne, Toothpaste, *Propionibacterium acne*, *Staphylococcus aureus*

## 1. INTRODUCTION

*Acne vulgaris* is a common inflammatory disorder of the pilosebaceous unit in the skin. Acne is a skin condition which mostly affects the face, the back and the upper parts of the torso. In mild to moderate cases, acne appears as comedones (blackheads and whiteheads), pustules, papules and red, scaly skin. It is more common in males and typically begins at puberty. In severe cases, acne can have inflammatory presentations such as nodules and cysts as well as cause scars. Acne is primarily caused by changes in the hormonal balance of the body. More specifically, the onset of puberty usually coincides with the first eruption of acne because of rising levels of androgens such as testosterone and its metabolite, dihydrotestosterone. These male hormones change the nature

of the sebaceous follicles and lead to the clogging of skin pores with plugs made of sebum, dead skin cells and bacteria.

Apart from the androgens, the other major cause of acne is the bacterium, *Propionibacterium acnes*<sup>1,2</sup>. *Propionibacterium acnes* (*P. acnes*) are an anaerobic gram-positive bacillus that lives as a normal commensal microorganism in the pilosebaceous unit. The abnormal desquamation of follicular epithelium causes an anaerobic condition in the follicle which promotes the proliferation of *P. acnes*. and *P. acnes* metabolize the glycerol moiety of excessive sebaceous triglycerides into free fatty acids by excreting a bacterial lipase and chemotactic factors. These excessive free fatty acids produced gather leukocytes around a follicle that cause inflammation. Therefore, inhibition of *P. acnes* will minimize the rupture of comedones into surrounding tissue and block the development of acne. Another organism that has also been implicated in the etiology of acne vulgaris is *Staphylococcus aureus* which promotes pustules and nodules. Therefore, treatment for acne can target either or both the bacterium and/or the increased productions of androgens.

\*Corresponding Author

Dr. Preeti Dharmik

Department of Microbiology, Shivaji Science College,  
Congress Nagar, Nagpur-440012, Maharashtra, India

Email: [drgomashe@rediffmail.com](mailto:drgomashe@rediffmail.com), [preetidharmik5@gmail.com](mailto:preetidharmik5@gmail.com)

Both herbs and conventional medications can treat acne by restoring hormonal balance and killing off *P. acnes*.

Many antibiotics have been used both orally and topically for acne treatment such as tetracycline, erythromycin as well as clindamycin. It was found that long term use of these broad-spectrum antibiotics often developed overgrowth of *Candida albicans*<sup>2</sup> as well as bacterial resistance, and topical chemical anti-acne agents such as benzoyl peroxide, azelaic acid and retinoic acid caused skin irritation. This may decrease patient compliance and result in treatment failure.

Owing to this fact, in the current study we have investigated the anti-acne role of Different toothpastes. Tooth brushing with toothpaste is the most widely practiced form of oral hygiene in most countries<sup>3</sup>. The success of any toothpaste, in part, lies on its ability to eliminate pathogenic oral microflora. Till now very few articles proved the role of toothpaste in acne treatment in addition to oral hygiene. Hence we have attempted to isolate and identify the acne causing bacteria in vitro and tried to kill them by using different types and brands of toothpastes. In addition we have also tried it on 10 human subjects to confirm its clinical use. We have also compared the anti-acne activity of toothpastes with the other herbal remedies viz., *Ocimum tenuiflorum* (Tulsi) extract, *Azadirachta indica* (Neem) extract, *Aloe vera* extract, Tea tree oil and olive leaf extract for acne.

## 2. MATERIALS AND METHODS

### 2.1 Test organisms

Total 50 multiple isolates of *Propionibacterium acne* (n=20) and *Staphylococcus aureus* (n=30) were isolated from pus swab from the persons having acne. All these isolate were preliminarily characterized on the basis of Morphological, Biochemical and Cultural characteristics which were later confirmed by VITEK compact 2 identification system (Biomauriex, France). *Propionibacterium acne* MTCC1951 and *Staphylococcus aureus* NCIM 2672 were used as control.

### 2.2 Herbal remedies

Total Five herbal remedies were taken viz., *Ocimum tenuiflorum* (Tulsi) extract, *Azadirachta indica* (Neem) extract, *Aloe vera* extract, Tea tree oil and olive leaf extract. The leaves of Tulsi, Neem, Aloe vera and Olive were first crushed in mortar and

pastel and filtered with muslin cloths which were directly used to study the antimicrobial activity.

### 2.3 Toothpastes used

Five different types of Toothpastes were used in the current study viz., Colgate, Closeup, Pepsodent, Miswak and Cholate visible white.

### 2.4 Antimicrobial sensitivity testing

Antimicrobial activities of all test substances against *Propionibacterium acne* and *Staphylococcus aureus* were screened by well diffusion method<sup>1, 4</sup>. For this overnight grown culture of test organism was used. Muller Hinton agar (HiMedia, Mumbai) plates were prepared and wells were made by sterile cork borer. Plates were streaked with the test organism and wells were filled with the given extracts and different toothpastes. The plates were incubated at 37°C aerobically for *S. aureus*, anaerobically for *P. acnes* at 37°C. The diameter of inhibition zone was measured, including well size, after 24 hrs incubation for *S. aureus* and 72 hrs incubation for *P. acnes*.

### 2.5 Minimum inhibitory concentration of toothpastes

The toothpaste (Colgate) sample was diluted in sterile water and series of dilutions 0.5, 2.5, 1.25, 0.06, 0.03, 0.01, 0.005, 0.0025 g/ml were prepared. The different concentration of toothpastes were known as 1,2,3,4,5,6,7,8 and water was employed as the negative control.

## 3. RESULTS AND DISCUSSION

No matter how much you try to keep your face nice and clean, some annoying pimples will appear sooner or later. There are many skin care products that can be used to treat pimples, but there are also many home remedies that you can use to get rid of the pimples. Acne vulgaris (or simply acne) is a common human skin disease, characterized by areas of seborrhea (scaly red skin), comedones (blackheads and whiteheads), papules (pinheads), nodules (large papules), pimples, and possibly scarring<sup>5</sup>. Aside from scarring, its main effects are psychological, such as reduced self-esteem<sup>6</sup> and in very extreme cases, depression or suicide<sup>7</sup>. One study has estimated the incidence of suicidal ideation in patients with acne as 7.1%<sup>8</sup>.

Many different treatments exist for acne including benzoyl peroxide, antibiotics, retinoids, antiseborrheic medications,

anti-androgen medications, hormonal treatments, salicylic acid, alpha hydroxy acid, azelaic acid, nicotinamide, and keratolytic soaps<sup>9</sup>. They are believed to work in at least four different ways, including the following: normalizing shedding and sebum production into the pore to prevent blockage, killing *P. acnes*, anti-inflammatory effects, and hormonal manipulation<sup>10</sup>.

Numerous natural products have been investigated for treating people with acne.<sup>11</sup> Azelaic acid has been shown effective for mild-to-moderate acne when applied topically at a 20% concentration<sup>12</sup>. Application twice daily for six months is necessary, and treatment is as effective as topical benzoyl peroxide 5%, isotretinoin 0.05%, and erythromycin 2%<sup>13</sup>. Azelaic acid may cause skin irritation but is otherwise very safe<sup>14</sup>. A topical application of tea tree oil has been suggested<sup>15</sup>.

Now a day, organisms are gaining resistance towards routinely used antimicrobials and other drugs. Acne causing bacteria are not the exceptions. They also acquired resistance to medicines and herbal products as well. Hence in the current research work, the attempt has been made to use toothpaste as one of the best anti acne products. In this regards, in the present study, facial swabs from the acne people (n=10, female=5, male=5) were taken which were screened for the well proven acne causing bacteria *Propionibacterium acne* (n=20) and *Staphylococcus aureus* (n=30). All the isolates were confirmed by automated VITEK compact 2 identification system (bioMérieux, France).

In the study five herbal extracts and oil were taken and tested for screening the antimicrobial activities against *S. aureus* and *P. acnes*. Surprisingly it has been found that (Table 1), majority of the isolates showed resistance towards given routinely used herbal extracts and oil. Later on all the isolates were subjected to antimicrobial action of different toothpastes. Among the toothpastes used, Colgate showed promising results (Table 2) in vitro against both the acne causing organisms followed by Colgate visible white and close-up. But when these toothpastes were applied topically on human subjects it has been found that, Colgate visible white starts irritation and itching soon after application. It may be due to whitening toothpaste contains bleaching agents (for making teeth whiter), which may actually bleach or burn the skin cause patchiness. This was particularly

happened in case of people with dark skin tones as the extra melanin in the skin makes it more reactive therefore more prone to marks and blemishes. People with fair skin were found less affected by such ingredients. However, we can say that it is better to avoid whitening toothpaste regardless.

Topical application of Colgate was found to be best in healing the pimple in all the 10 selected human volunteers. This may be due to its low fluoride content. Fluoride is added to over 95% of the toothpastes as it helps to remove dental plaques and prevent gum diseases. However, many people actually suffer from a mild topical allergy to fluoride as it may cause dermatitis (a skin rash). For this reason it is best to found toothpaste with as low fluoride content as possible (or fluoride free if you find it) to minimize the risk of irritation. In addition to this, Colgate gave better results because it is a paste and not a gel. Toothpastes in gel form, showed moderate healing activity. It is due to the fact that toothpaste works like a mask for oily skin. When we apply it on the white headed pimple it will dry it and absorb the oil, this is not the case with gel toothpastes

Further, when Close-up and Pepsodent were applied on the pimples, the results were not that much promising. This may be due to the ingredients which help to dry out the pimples such as backing soda; hydrogen peroxide and triclosan are contained in the white part of the toothpaste while colored section red, blue or green may contain ingredients which will irritate the skin.

In the current study we also found that, toothpaste pimple treatment may not be helpful with every pimple. It worked well only with pimples that have already turned into whiteheads. Also, it may not be helpful with blackheads or those pimples that are still only red spots. Toothpaste dries the pimple and applying it to the pimples that are not ready yet will only make things worse as it will irritate the skin and cause redness.

Later on we have calculated the MIC of Colgate as it showed the highest anti acne activity. Among all the prepared concentrations, 1.25g/ml was found to be effective as it healed the acne in a week.

**4. CONCLUSION**

From the current investigation we can conclude that Toothpaste (Colgate) may be one of the best remedies against acne and it may be the easiest way to reduce pimple but the treatment is only effective on those pimples that have already turned into white heads. As we have gone through the topical applications on acne people, we would like to quote some recommendations while using toothpaste pimple treatment:

1. **Wash your face:** As with any spot treatment, it is important to apply the toothpaste to clean, dry skin. This ensures that there is no dirt or excess oil on the skin that may limit the effectiveness of the treatment. Wash your face well with warm water and your favorite cleanser, then pat dry to lock in moisture
2. **Squeeze a little toothpaste onto your finger:** Squeeze a little toothpaste onto your index finger or the back of your hand. A pea-sized amount should be enough, depending on the number of pimples you're treating.
3. **Apply a small amount of toothpaste directly onto the pimple:** You will only need to apply a very small amount of toothpaste to the pimple for the treatment to be effective. Just make sure that you apply the toothpaste directly onto the pimple itself, not on the surrounding skin. Toothpaste should *never* be spread all over the skin or used as a face mask. This is because the toothpaste works by drying out the skin, which can cause redness, irritation and peeling if applied anywhere but the pimple itself.
4. **Leave the toothpaste on for two hours or overnight:** Leave the toothpaste on for two hours or overnight, for best results. However, if you have extremely sensitive skin, it may be best to remove the toothpaste after 15 minutes to half an hour, in order to gauge your skin's reaction. If it seems to be handling the toothpaste okay, you can leave it on for increasingly longer periods.
5. **Gently wash off:** You can wash off the toothpaste with a damp washcloth, using small, circular motions. Make sure to do this very gently, as rubbing too hard might irritate or damage the skin. When all the toothpaste has been removed, splash your face with some warm water and pat dry with your hands or a clean, soft towel. You may want

to apply a soothing moisturizer if your skin feels very tight and dry.

6. **Repeat no more than four times a week:** As mentioned before, toothpaste may be irritating, especially if you have sensitive skin, so this is not a treatment you should be using multiple times a day or more than four times a week. After applying the treatment once a day, 2-3 days in a row, you may notice an improvement in the size and color of the pimple. From that point on, you should allow the pimple to heal on its own.

**Table 1:** Antimicrobial activity of herbal Extracts and Oil

Herbal extracts	<i>Propionibacterium acne</i> (n=20)		<i>Staphylococcus aureus</i> (n=30)	
	Sensitive	Resistant	Sensitive	Resistant
Tulsi	3	17	6	24
Neem	5	15	4	26
Aloe vera	4	16	7	23
Olive leaf	1	19	11	19
Tea tree oil	7	13	14	16

**Table 2:** Antimicrobial activity of various toothpastes

Tooth pastes	<i>Propionibacterium acne</i> (n=20)		<i>Staphylococcus aureus</i> (n=30)	
	Sensitive	Resistant	Sensitive	Resistant
Colagate	19	1	28	2
Closeup	14	6	23	7
Miswak	9	11	23	7
Pepsodent	12	8	21	0
Colagte Visible white	15	5	26	4

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