

# Comedogenicity of Oils

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## ABSTRACT

**Introduction:** Controversies exist regarding comedogenicity and antimicrobial property of different oil. In Kerala, oil application to the face is a daily routine for many. Giving advice to our acne patients regarding oil application has always been without much conviction. Study aimed to assess the comedogenicity of coconut oil on rabbit ear.

**Material and methods:** This study was conducted by the Dermatology department in Amala Institute of Medical Sciences animal house, with the guidance from the research department. This study was conducted on rabbit ear model to assess comedogenic potential and antimicrobial properties of commonly used oils.

**Results:** All the oils studied were equally comedogenic and showed no antibacterial property.

**Conclusion:** Application of coconut oil, mustard oil or liquid paraffin to acne prone skin is not advisable in our environmental conditions and there is no antibacterial property for any of these oils.

**Keywords:** Acne Veneneta, Antimicrobial, Comedogenicity, Follicular Keratinization, Oils

suitable emollient and treatment modality for acne by certain forums. Mustard oil and virgin coconut oil are claimed to have antiseptic properties. There are contradicting reports regarding the comedogenicity of mineral oil<sup>3,4</sup>. Amidst all these confusions, giving advice to acne patients regarding oil application has always been without proper conviction. So we thought of conducting this study to get first hand opinion on these issues.

The rabbit ear assay has been used as a method for measuring follicular keratinization induced by externally applied products<sup>1</sup>. The advantage of this model is that it is a rapid screening tool as it takes only two weeks to develop follicular impaction in rabbit ear, while it may take months to develop similar reaction on human skin. The disadvantage is its extreme sensitivity. Materials found to be non comedogenic on rabbit assay appear to be non comedogenic on human skin. Whether all the highly comedogenic ingredients on rabbit ear are always comedogenic on humans still remains uncertain. At present the consensus is that it is better to avoid the use these substances on acne prone skin<sup>3</sup>.

Study aimed to assess the comedogenicity of coconut oil on rabbit ear, to compare the comedogenicity of different locally available variants of coconut oil, mustard oil, liquid paraffin on the rabbit ear and to assess the antiseptic property of these oils

## MATERIAL AND METHODS

The different oils included in the study were

1. Virgin coconut oil - prepared from undried coconut.
2. Coconut oil from the mill - locally extracted from Copra and commonly used.
3. Parachute oil - popular brand of coconut oil.
4. Mustard oil - used in other states in India.
5. Liquid paraffin - mineral oil a prevalently used local brand was used.

This study was conducted by the Dermatology department in Amala Institute of Medical Sciences animal house, with the guidance from the research department. Clearance from institutional research committee and animal ethical committee was obtained for the study. A total of 24 adult

## INTRODUCTION

Acne is a chronic inflammatory disease of pilosebaceous unit resulting from androgen induced seborrhea, altered keratinization, bacterial colonization of hair follicle and inflammation. Genes definitely influence acne. Diet, stress and external applications are known to trigger and exacerbate acne. Acne induced by cosmetics and other external applications are denoted as acne veneneta, acne cosmetica<sup>1</sup> and pomade acne. Substances which aggravate or initiate acne are called comedogenic substances<sup>1</sup>. The comedogenic potential of many external agents and cosmetics have been studied and graded<sup>2,3</sup>. But there is no clear consensus regarding the comedogenicity of many substances as discrepancies exist between different studies. Many oils are known to be comedogenic and a few are non comedogenic<sup>2,3</sup>.

Kerala being the land of KERA (Coconut), traditionally and most extensively uses coconut oil for all purposes. Coconut oil is extracted from the dry kernel of coconut. Virgin coconut oil which is considered to be purer and healthier and is much more expensive is extracted from undried ripe coconut. In Kerala, oil bath is a daily ritual for many. Here people apply coconut oil liberally on hair, scalp, face and all over the body before and even after bath. This is considered to be refreshing and cooling. Medicinal properties have been attributed to many oils, different concoctions and modifications are used for hair health and growth, to treat diseases and for rejuvenation. Virgin coconut oil is recommended as a

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male, almost same ages, rabbits were included. A prior swab and bacteriology culture was done from the inner aspect of pinna. A preliminary biopsy was done in three rabbits from the inner aspect of pinna just external to external auditory meatus which would be our study site. This was to familiarize the pathologist to the normal rabbit ear structure, to look for already existing comedone like impactions and as a control. These ears were not included in the study. The rabbits were divided into 4 groups with 6 rabbits in each group and caged separately. They were colour coded with red blue and violet stains. The rabbits were fed on carrot, cabbage, green grass and Bengal gram.

A specific type of oil was applied to a specific group, daily, on the concave area on the inner aspect of right pinna just outside the external auditory meatus. Liquid paraffin was applied to the other pinna. After 5 weeks, swab and bacteriology culture was repeated from the inner aspect of pinna. Four millimeter punch biopsies were done from the pinnae from the oil applied sites and subjected to histopathological analysis. Presence and grades of comedones were assessed histologically and compared with control biopsy which was done prior to oil application and also with the other groups. The presence of comedones was graded on a scale 0 to 3.

### STATISTICAL ANALYSIS

There were 5 oils to be compared. They were compared on the basis of 4 grades of comedone. Fisher's exact test was used in each case. Since the p-value in each case is greater than 0.05, we accept the null hypotheses. Hence it is concluded that all oils studied are identical with respect to their effect in producing comedone.

### RESULTS

Only 20 rabbits survived the study period of 5 weeks as 4 rabbits died due to diarrheal illness. The exact cause of death was not ascertained, autopsy was not performed.

#### Bacterial culture - before oil application

Ear swab was taken before application of oil from 24 rabbits and cultured on Blood agar, MacConkey agar, Thioglycollate broth. Varieties of organisms grew in all the 24 samples with minor variations in few animals.

#### Organisms grown

1. Coagulase negative staphylococci – 2 strains
2. Alpha hemolytic streptococci
3. Bacillus subtilis
4. Non fermenting gram negative bacilli
5. Pseudomonas spp ( in few samples)
6. Hafnia ( in few samples)
7. E.coli ( in few samples)
8. Staph. aureus ( 1 sample)
9.  $\beta$  hemolytic streptococci (1 sample)

#### Bacterial culture - after oil application

Ear swab was taken after the 5 week study period from 20 right ears and 5 left ears of the 20 surviving rabbits and cultured on Blood agar, MacConkey agar, Thioglycollate broth.

Variety of organisms were grown in all the 25 samples with

	Grade 0	Grade 1	Grade 2	Grade 3
Virgin oil		1	3	
Mustard oil		1	3	2
Oil from Mill		2	2	
Parachute	2	1	2	1
Paraffin	2	1		2

**Table-1:** Grades of comedo on histopathological analysis

minor variations in few animals.

Organisms grown:

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6. Hafnia ( in few samples)
7. E.coli ( in few samples)
8. Staph. aureus ( 1 sample)

### Histopathologic analysis

Histological examination was performed at the end of 5 weeks. Punch biopsies of 4 mm size were taken from the treated sites. Vertical sections were evaluated for histological evidence of follicular plugging as defined by the American Academy of Dermatology Comedogenicity Consensus Group recommendations as follows<sup>5</sup>:

Grading Scale (Table-1):

0 = No comedogenesis

1 = The presence of a relatively small amount of compact horny material occupying the infundibulum

2 = The presence of a moderate amount of compact horny material that widens the infundibulum and extends into the sebaceous ducts

3 = The presence of dense horny material that distends the follicle, resembling a human open comedo.

### DISCUSSION

Cosmetic acne was first reported by French dermatologists in the mid-forties. They reported on brilliantines and hair pomades causing flare-ups on the temple and forehead facial regions. They attributed the problems to impurities in the brilliantines<sup>6</sup>. Fulton published results on actual cosmetic lines and on ingredients, and proposed the development of noncomedogenic cosmetics using ingredients that were non offenders in the rabbit ear assay<sup>7,8</sup>. In a 1972 paper entitled "Acne cosmetica," Kligman and Mills reported that as many as 50% of commercial cosmetics were comedogenic in the rabbit ear model<sup>1</sup>. Since then, this assay has been extensively used by producers of drugs and cosmetics to assess their potential for inducing acneiform eruptions. The ultra-sensitivity of the rabbit follicle to respond readily to test materials has been extensively documented.<sup>9</sup>

A comedogenic substance is defined as anything which tends to produce or aggravate acne<sup>1</sup>. In the present study comparing comedogenicity of different oils on the rabbit ear we have found that all the oils studied are equally comedogenic. This is in contrast with previous reports that mineral oil is non comedogenic. Using the original model Kligman and Mills

had stated that petrolatum and mineral oils from different sources were uniformly comedogenic <sup>1</sup>, but a later study by Kligman on human volunteers conducted in dry winter months claimed that pure petrolatum was non comedogenic <sup>4</sup>. Our part of Kerala is very humid in all seasons except in the months of December and January. Our study was conducted in August, September when the humidity is very high. The purity of locally available mineral oil is also questionable. The present study results are consistent with the previous reports stating that coconut oil is a highly comedogenic substance <sup>2</sup>. Virgin coconut oil which is claimed to be non comedogenic and is even advised as a treatment for acne is also found to be of similar effects as other comedogenic oils in our study.

There are no previous studies on the comedogenicity of mustard oil. From our study mustard oil was found to be equally comedogenic as the other oils.

On bacteriological study, all the oils were found to be similar as they did not cause any significant change in the bacterial flora. This contrasts with the popular opinion that mustard oil and virgin coconut oil have antiseptic properties.

The limitation of our study is small sample size and we are not sure whether the results will be reproducible in human subjects.

## CONCLUSION

Application of coconut oil, mustard oil or liquid paraffin to acne prone skin is not advisable in our environmental conditions and there is no antibacterial property for any of these oils.

### Conflict of interest

The study was conducted with financial help from Marico India Ltd

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## REFERENCES

1. Albert M. Kligman and O.H Mills. Acne cosmetica . Arch Dermatol 1972;106, 843.
2. Shawn H. Nguyen, Thao P. Dang and Howard I. Maibach. Comedogenicity in Rabbit: Some Cosmetic Ingredients/Vehicles. 2007;26:287-292.
3. James E . Fulton. Comedogenicity and irritancy of commonly used ingredients in skin care products. J. Soc Cosmet. Chem.,1989;40:321-333
4. Albert M. Kligman . Petrolalum is not comedogenic in rabbits or humans: A critical reappraisal of the rabbit ear assay and the concept of "acne cosmetica". J. Soc. Cosmet. 1996;47:41-48.
5. Strauss J S, Jackson EM. American Academy of Dermatology. Invitational symposium on Comedogenicity . J Am Acad Dermatol. 1989; 20: 272-277.
6. H. Gougerot, A Carteaude , and E . Grupper. Epidermic de coedons par les brillantines, crèmes etc. de gerer,

Bull.Soc.Franc Derm Syph 1945;52:124-125.

7. J. E. Fulton, S . Bradley, et al, Noncomedogenic cosmetics,Cutis, 1976; 17: 344-351.
8. J. E Fulton, Jr, S.R. Pay, and J E Fulton III, Comedogenecity of current therapeutic products, cosmetics, and ingredients in the rabbit ear. J Am Acad Dermatol., 1984;10: 96-105.
9. Kligman AM, Katz, AG. Pathogenesis of acne vulgaris. I. Comedogenic properties of
10. human sebum in external ear canal of the rabbit, Arch Dermatol 1968; 98:53-57.

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