

Efficacy of Castile Soap at Reducing Numbers of *Demodex spp.* (Trombidiformes: Demodicidae) on Females

Maria Atanasiu
Editor: Elise Woodruff

Abstract: Studies into the complex relationship between *Demodex spp.* (Trombidiformes: Demodicidae) are important as they may provide insights into the physiology of certain skin conditions. *Demodex spp.* are a type of mite that feeds off of the oils that are produced in the follicles and pores of the face. Normally, this relationship is harmless and mutualistic in nature. However, Demodicosis is a skin condition caused by overpopulation of *Demodex spp.* New, non-invasive treatments for demodicosis are desirable, as they could improve quality of life for affected individuals that have minimal access to healthcare. In this study, the effects of unscented castile soap are assessed regarding *Demodex spp.* populations. Liquid glue and tape were used to collect mites; the mites were then placed on a microscope slide for observation and quantification. Prior to collection, each non-control subject washed their face with castile soap. Samples were gathered over a nine day period to allow for the observation of potential trends. The results show that there were no significant differences in numbers of face mites by use of castile soap versus water.

Keywords: Castile soap, demodicosis, *Demodex spp.*

Demodex spp. (Trombidiformes: Demodicidae) are a species of mites known to reside in the hair follicles of human skin. Although their complex relationship with human skin has been well documented in terms of variation between different hosts, there is less documentation of variation in *Demodex spp.* activity and numbers within singular hosts (Palopoli et al. 2015). An investigation into *Demodex spp.* variation within singular hosts may provide insights into their activity levels in relation to varying facial conditions, skin types, and skin

conditions (e.g. skin care techniques, weather, time of day, etc.). Additionally, insights into variations in *Demodex spp.* in relation to skin care techniques could provide insights into potentially less invasive and less expensive means of treating skin conditions related to *Demodex spp.* overpopulations.

There are two main species in the *Demodex* genus that are known to reside on human skin, *D. folliculorum* and *D. brevis* (Rather and Hassan 2014). *D. folliculorum* is known to reside in hair follicles closer to the surface

of the skin, and *D. brevis* is known to reside deep in the sebaceous pores of the skin. Both are known to be most active at night and have an average lifespan of several weeks (Rather et al. 2014). Different varieties of face mites have been recorded along with the varying demographics of their hosts; this suggests that co-evolution may have arisen resulting in divergent evolution of species (Palopoli et al. 2015). In the absence of previously limiting geographic barriers, people with drastically different lineages of face mites are likely to come into contact with one another. Studies have shown that using a mild to moderate cleanser on the face (Yuan et al. 2017) or using a mild face wash containing tea tree oil can help reduce the numbers of *Demodex spp.* on a person's face (Murphy et al. 2018). This study will analyze the effects of using castile soap, a mild cleanser, on mixed skin types and its efficiency at clearing *Demodex spp.* This study will investigate if castile soap will decrease the amount of these face mites on the face more effectively than water.

Materials and Methods

The experiment was conducted on Texas A&M University campus between the dates of March 16, 2020 and March 24, 2020. The subjects for this experiment were six Texas A&M undergraduate female students between the ages of 18 and 21. The subjects selected each had a combination skin type and did not put on any type of makeup for the period of this experiment. In order to control the factors that could affect the study, each subject maintained similar face wash routines. The control group consisted of three subjects who washed their face only with

water each night before going to bed. The other three subjects washed their faces each night for one minute each with one pump of castile soap. Experimental subjects one, three and five served as a control group and therefore, did not use castile soap to wash their face. Subjects two, four, and six served as the castile soap trials.

The materials used to conduct this experiment include clear tape, liquid glue, microscope slides, and a six-quart storage bin. Each subject met at the HEEP building at 10:00 AM and stayed in the building for an hour before the study was conducted in order for the environment to be controlled. The glue was spread into a thin layer on the subjects' foreheads right above the eyebrows and was left to dry for around ten minutes. Face mites were then collected off of subjects' foreheads using the tape to secure the glue layer. The tape was then placed on a microscope slide and stored. The face mites were then observed and counted under a light microscope. Collection began on March 16, 2020 and occurred every other day for nine days, for a total of five days of collection.

Results

The number of *Demodex spp.* was quantified for each subject (Table 1). The results found were no significant differences in numbers of face mites by use of castile soap versus water. As for the control trials, the amount of *Demodex spp.* collected on subject one decreased from five to zero mites throughout the nine-day period. Subject three originally had a decrease of *Demodex spp.* from eight to zero with one mite being collected on day

seven and nine. Subject five had great fluctuation in mite numbers with the amount of *Demodex spp.* originally decreasing from three to zero, then increasing back to one at day five, with zero mites being collected on the final day. In terms of the castile soap trials, subject two had a decrease in *Demodex spp.* from six to zero mites over the experimental period. Subject four had great fluctuation in *Demodex spp.* with mite collection decreased from five to zero by day seven and an increase back to one mite on the

final collection event. Subject six had a similar result with the amount of *Demodex spp.* decreasing from seven to zero at day five, increasing to two at day seven, and then decreasing to one on day nine.

Overall, all subjects had a decrease in the amount of face mites collected from their forehead by the final day, and no significant difference was found between the control group and the castile soap trials.

Table 1. Number of *Demodex spp.* on subjects

Subject	1	2	3	4	5	6
Treatment	Control: no castile soap	Castile soap	Control: no castile soap	Castile soap	Control: no castile soap	Castile soap
Day 1	5	6	8	5	3	7
Day 3	3	3	4	3	0	4
Day 5	1	2	0	1	1	0
Day 7	1	1	1	0	1	2
Day 9	0	0	1	1	0	1

Discussion

The purpose of this study was to understand the prevalence of *Demodex spp.* on the human face in conjunction with different facial conditions, namely the use of castile soap. The forehead was tested as studies have shown that this particular genus is found primarily around eyebrows, feeding on sebum in the oil glands (Eroglu et al. 2019). It was observed that castile soap significantly decreased the number of mites found on the face by day three.

However, the use of only water as a cleanser was also found to decrease *Demodex spp.* on the face at around the same rate. Therefore, the relationship between castile soap and reduction of *Demodex spp.* cannot be considered statistically significant when compared to the use of water. A possible reason for this could be that the chemicals in castile soap.

are simply not strong enough to significantly reduce mite populations. Castile soap contains natural ingredients, while previous studies have used cleansers that contain more harsh chemicals such as salicylic acid (Yuan et al. 2017). Another downfall of this study might have been that the sample size was too small to get statistically significant results. The amount of time subjects spent in the same building to get acclimated to the temperature and humidity could have been too short. There could have still been variability in the skin types of each subject. Also, there could have been flaws in the collection method

itself that resulted in fewer mites being observed. It is also difficult to make an accurate analysis because subjects were not being monitored on the amount and types of soaps such as shampoo, conditioner, and body wash used outside of testing. This factor should likely be controlled for in continuing research. In future studies, the subject group should all be in the same house or setting where the temperature, weather, and humidity can be controlled. These steps combined with the utilization of stronger cleansers may lead to a more cost effective and less invasive means to controlling problems associated with *Demodex spp.* overpopulation.

Works Cited:

- Aumond, S., and E. Bitton. 2019.** Palpebral and facial skin infestation by *Demodex folliculorum*. Cont. Lens Anterior Eye.
- Elston, C. A., and D. M. Elston. 2014.** Demodex mites. Clin. Dermatol. 32: 739-743.
- Eroglu, S., M. Cakmakliogullari, and E. Kal Cakmakliogullari. 2019.** Is the presence of *Demodex folliculorum* increased with impaired glucose regulation in polycystic ovary syndrome? Obstet. Gynecol. 2019: 1-5.
- How to test for demodex mites.** Demodex Solutions Ltd.
<https://www.demodexsolutions.com/c/how-to-test-for-demodex-mites/>
- Isa, N. H. M., L. W. Loong, G. H. Fang, A. M. Mohamad, N. Razali, N. I. Rani, S. N. A. A. Manap, and S. R. Abdullah. 2011.** Demodicosis among university medical students in Malaysia and the effects of facial cleanser and moisturizer usage. Southeast Asian J. Trop. Med. Public Health 42: 1375-1380.
- Murphy, O., V. O'Dwyer, and A. Lloyd-McKernan. 2018.** The efficacy of tea tree face wash, 1, 2-Octanediol and microblepharoexfoliation in treating *Demodex folliculorum* blepharitis. Cont. Lens Anterior Eye 41: 77-82.
- Palopoli, M. F., D. J. Fergus, S. Minot, D. T. Pei, W. B. Simison, I. Fernandez-Silva, M. S. Thoemmes, R. R. Dunn, and M. Trautwein. 2015.** Global divergence of the human follicle mite *Demodex folliculorum*: persistent associations between host ancestry and mite lineages. Proc. Natl. Acad. Sci. U S A 112: 15958.
- Rather, P. A., and I. Hassan. 2014.** Human demodex mite: the versatile mite of dermatological importance. Indian J. Dermatol. 59: 60-66.
- Yuan, C., S.-L. Zheng, Y. F. Ma, Juliandri, and H. Philippe. 2017.** Cleanser use could decrease numbers of *Demodex Folliculorum* in mild to moderate acne patients. Dermato-Endocrinology 9: e1348444.
- Zeytun, E., E. Tilki, S. Doğan, and K. Y. Mumcuoğlu. 2017.** The effect of skin moisture, pH, and temperature on the density of *Demodex folliculorum* and *Demodex brevis* (Acari: Demodicidae) in students and staff of the Erzincan University, Turkey. Int. J. Dermatol. 56: 762-766.