# Scientists complete genome sequence of fungus responsible for dandruff, skin disorders

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Scientists from P&G Beauty announced that they successfully sequenced the complete genome for *Malassezia globosa (M. globosa)*, a naturally occurring fungus responsible for the onset of dandruff and other skin conditions in humans. Results of the genome sequencing are published in today's online edition of *Proceedings of the National Academy of Sciences*.

Dandruff and seborrheic dermatitis affect more than 50 percent of the human population. Despite the role of *Malassezia* in these and other common skin diseases, including eczema, atopic dermatitis and psoriasis, little was known about the fungus at the molecular level until this study. In addition, understanding of *Malassezia*'s genetic make-up may help scientists reevaluate the parameters that have historically been used to classify fungal organisms.

*M. globosa*, which is among the smallest of the sequenced free-living fungal organisms, is comprised of just around 4,285 genes – roughly 300 times fewer base pairs than are found in the human genome. A common fungus that lives on the skin of humans, *M. globosa* feeds off of fatty external lipids. Humans naturally secrete sebum and other lipids onto the scalp, creating a prime environment for *M. globosa* to thrive. The average human can host to up to 10 million *M. globosa*. Symptoms of dandruff and seborrheic dermatitis occur when three factors come together: genetic susceptibility for an inflammatory response, the

presence of sebum on the scalp and the presence of *M. globosa*.

"A complete genomic sequencing of a *Malassezia* genome opens tremendous opportunities for researchers to understand the interactions of fungi and humans," said Thomas Dawson, Ph.D., a scientist at P&G Beauty and the principal author of the PNAS study. "It's amazing that the understanding of the genetic make-up of a microscopic organism can have broad implications ranging from human health to agricultural science."

## Research and Treatment Implications

The family of *Malassezia* species affects a wide range of human health issues. While *M. globosa* is related to a host of irritant conditions, other types of *Malassezia* have been found to be particularly threatening to individuals with early and compromised immune systems, including infants and those suffering from autoimmune diseases. This fungus family also plays a role in skin and respiratory allergies.

Beyond human health, these findings have agricultural implications. *M. globosa* is also very closely related to multiple common plant pathogenic fungi that cause disease on corn, wheat, and other important food source crops. Comparative genomic studies are now underway that could lead to new strategies for managing these related crop diseases.

“What started as an effort to unlock the mechanism behind dandruff has opened the scientific doors for the development and enhancement of treatments for dandruff and many more *Malassezia*-related conditions,” said James Schwartz, Ph.D. and Research Fellow at P&G Beauty. “These advances were made possible through collaboration among multiple institutions and subject experts, and we’re excited that our findings may benefit multiple disciplines and specialties.”

*Malassezia* is a culprit in conditions mild to severe, but almost nothing was understood at the molecular level before this research. The genetic sequencing of *M. globosa* has expanded the range of potential treatment targets from a few observational characteristics to now more than 4,000 molecular targets.

## Science Behind the Sequencing

The genomic sequencing was made possible by DNA sequencing technologies developed within the last decade. Scientists previously tested many different compounds in a "trial and error" style to find ways to treat and reduce dandruff symptoms. In fact, due to the earlier use of less-accurate culture-based technologies, scientists incorrectly assumed for years that dandruff and seborrheic dermatitis were caused by a different type of fungus (*Malassezia furfur*). With the use of molecular science, the team uncovered the correct fungal species that was the primary cause of dandruff, eventually leading to the complete sequencing.

Source: Spectrum Science Public Relations