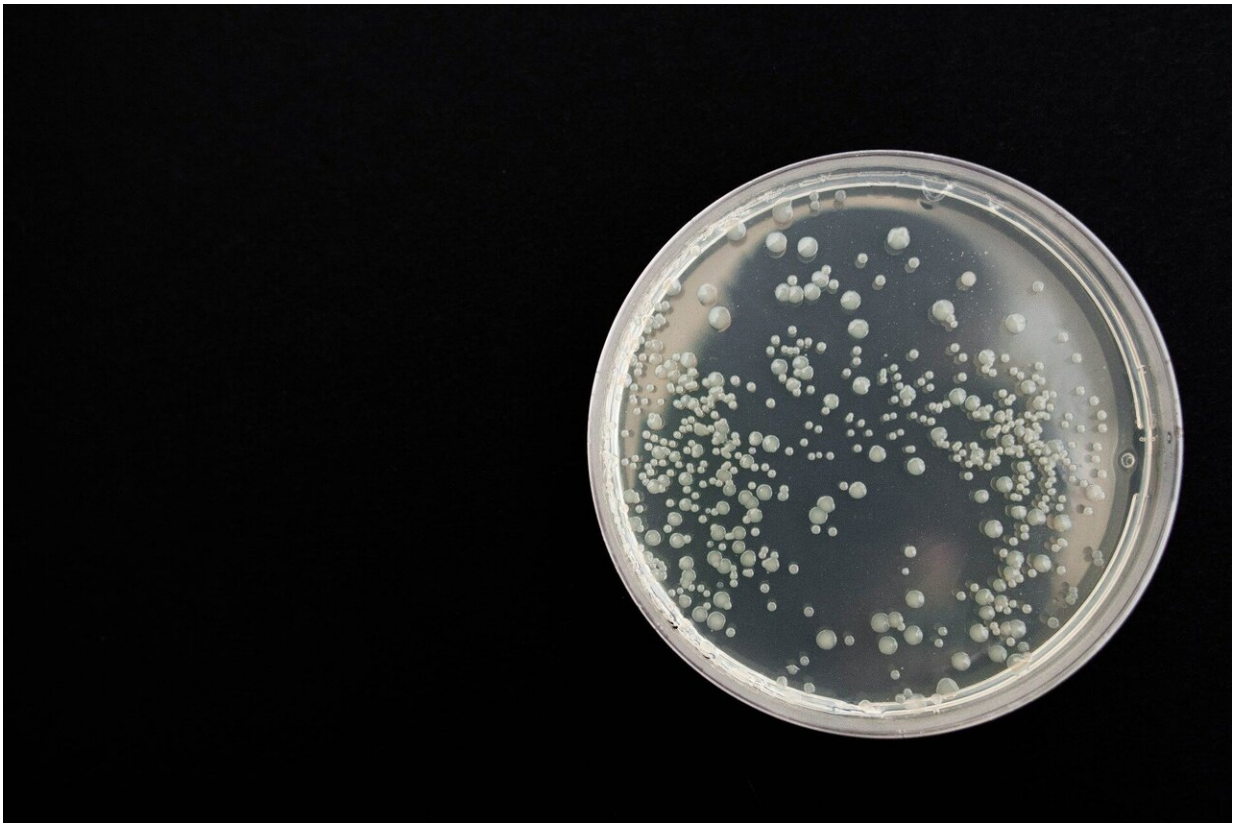
Study could help to defend humans and crops from yeast infection

March 1 2022



Credit: CC0 Public Domain

Clues to the mechanism of yeast infections, which present risks to both humans and crops, have been identified in research co-led at the University of Strathclyde.

The study has focused on a family of proteins, known as Mep-Amt-Rh, which enable them to transport ammonium, a significant compound involved in growth and differentiation of yeasts.

Three proteins of the family are found in baker's yeast but only one of these, Mep2, is capable of triggering filamentation, the process of cell growth which can lead to infection by pathogenic fungi.

The research has discovered that variations in Mep-Amt-Rh proteins affect the specificity and the type of mechanism for transporting ammonium. When two mechanisms co-exist within Mep2, they disrupt the signalling function which brings about filamentation and impede its progress.

The research could improve understanding of yeast infection in both humans and crop plants, enabling better defence against its effects.

The collaborative research was led by Dr. Arnaud Javelle at Strathclyde, Professor Anna Maria Marini and Professor Mélanie Boeckstaens at the Université Libre de Bruxelles and Professor Ulrich Zachariae at the University of Dundee. It has been published in the journal *mBio*.

Dr. Javelle, of Strathclyde Institute of Pharmacy and Biomedical Sciences, says that "pathogenic yeasts represent a significant threat to human health and wellbeing. This can be direct, with yeast infection causing sickness or even death in humans, or indirect, through infection of crop plants severely limiting production and resulting in food shortages."

"According to a *Nature Microbiology* editorial published in 2017, more than 300 million people suffer from serious fungal-related diseases and fungi collectively kill over 1.6 million people annually, which is more than malaria and similar to the tuberculosis death toll. Fungi and the

oomycetes organism destroy a third of all food crops each year, which would be sufficient to feed 600 million people."

"Our work brings new light to the understanding of the contribution of ammonium transporters to fungal pathogenicity and may help manage infection in the future."

Dr. Gordon Williamson, one of the lead authors from Dr. Javelle's laboratory, said: "This work exemplifies the need for collaborative and multi-disciplinary approach when trying to build understanding of these complex molecular machines."

The research about filamentation process considered a particular infection, Candidiasis, caused by the fungal species named Candida, which is widely recognized as a major cause of morbidity and mortality in the healthcare environment. The attributable mortality among all patients with bloodstream infection may be 10–20%, with the risk of death being closely related to increasing age.

The research groups are pursuing several follow-up projects, including translating their research to the human Rhesus proteins. Aside from their well-known role in blood-typing, malfunction of mammalian Rhesus proteins has also been associated with a range of diseases, from haemolytic anemia to reduction in male fertility and early-onset depressive disorders. It is hoped that the results of this work could form the basis of future therapeutic development.

More information: Gordon Williamson et al, Coexistence of Ammonium Transporter and Channel Mechanisms in Amt-Mep-Rh Twin-His Variants Impairs the Filamentation Signaling Capacity of Fungal Mep2 Transceptors, *mBio* (2022). DOI: 10.1128/mbio.02913-21

Provided by University of Strathclyde, Glasgow