Cystic fibrosis: yeast study may address root cause

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Cystic Fibrosis
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Yeast is helping to tackle the root cause of cystic fibrosis - a disease that results from faulty ion channels. A new study shows how a small molecule can take the place of a missing protein in yeast cells with faulty ion channels, enabling them to work again.

Most cases of cystic fibrosis are diagnosed by the age of 2.

The study, by researchers from the University of Illinois at Urbana-Champaign, is published in the *Journal of the American Chemical Society*.

All organisms - from microbes to humans - rely on protein pumps and channels that transport ions across the cell membrane. Faulty ion channels in cells underlie many currently incurable human diseases.

Cystic fibrosis is caused by a genetic mutation that affects some of the proteins that make up ion channels, causing them to malfunction. The result is a thick build up of mucus in the lungs and other organs, making breathing difficult.

While treatments for cystic fibrosis exist, they do not fix the underlying cause. Treatments include inhalants, enzyme supplements and clearing the airways, which can usually only be done with help.

Yeast is a useful organism for researching human health and disease because yeast cells are very similar to human cells. On two occasions, yeast has featured in studies that have won Nobel prizes (one in 2001, the other in 2009) for their work on human cells.

The new study describes how a small molecule can take the place of a missing protein to restore the type of ion channel function that is missing in people with cystic fibrosis and similar diseases. The molecule - amphotericin B - was originally extracted from bacteria and is used to treat fungal infections.

The small molecule caused deficient yeast to grow nearly as well as normal yeast

The team tested the small molecule at low doses in a strain of yeast that cannot grow because it has faulty ion channels.

When they added the molecule, the researchers found the yeast grew nearly as well as a normal strain that they used as a control. They note:

"Here we report vigorous and sustainable restoration of yeast cell growth by replacing missing protein ion transporters with imperfect small molecule mimics."

The authors say more research is needed to confirm whether the small molecule will work in human diseases like cystic fibrosis. In the meantime, however, they conclude that their study provides a "framework for pursuing such a therapeutic strategy."

People with cystic fibrosis are at greater risk of lung infection because the thick, sticky mucus that builds up in the lungs allows germs to thrive and multiply.

Fast facts about cystic fibrosis

- People with cystic fibrosis have inherited two copies of the defective CF gene
- About 70,000 people worldwide are living with cystic fibrosis
- Most cases are diagnosed by the age of 2.

Learn more about cystic fibrosis

Earlier this year, *Medical News Today* reported how researchers are reaching a better understanding of infections in cystic fibrosis. A small study of children with the disease reveals that the microorganisms that infect people with cystic fibrosis can survive on little to no oxygen.

Written by Catharine Paddock PhD

References

Restored physiology in protein-deficient yeast by a small molecule channel, Alexander G. Cioffi et al., *Journal of the American Chemical Society*, doi:10.1021/jacs.5b05765, published online 7 August 2015, abstract.

American Chemical Society news release, accessed 26 August 2015.

Additional source: Cystic Fibrosis Foundation, About cystic fibrosis, accessed 26 August 2015.

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