

Research at a Glance

Understanding individual and collective mechanisms behind cell membrane repair

What's known:

All cells are surrounded by a cell membrane: a double layer of lipids with embedded proteins that separates the inside of the cell from the outside environment. At only 10 nanometers in thickness, this layer is quite fragile. Any breach can be fatal for a cell, causing chemical imbalances by exposing its interior to the extracellular milieu.

Consequently, cells have evolved a set of responses to rapidly restore the integrity of the cell membrane in the event of a rupture, coordinating actions spurred by both immediate and longer-term signals. Research is providing a growing understanding of these repair mechanisms, which could go awry in degenerative diseases.

What's new:

Adam Horn, Ph.D., a postdoctoral fellow, and Jyoti K. Jaiswal, Ph.D., a principal investigator at Children's Center for Neuroscience Research and the Center for Genetic Medicine Research, recently co-authored a literature review article summarizing these cell membrane repair mechanisms and the signals that trigger them. They delve into a variety of resourceful ways that cells fix tears or holes in this membrane, including one akin to blood clotting that stuffs a tear with proteins, organelles or vesicles; another in which the proteins that give a cell structure (the cytoskeleton) disassemble, relaxing tension that helps pull the damaged membrane together; or one in which the damaged portion in the membrane is shed. These repairs are driven by signals that largely rely on a large calcium influx into the cellular fluid, which spurs into action a variety of repair-related proteins. Better understanding each element could help researchers develop new and better ways to treat degenerative diseases in which cells inadequately repair damage.

Questions for future research:

Q: How do the different types of signals coordinate individual and collective cell membrane repair mechanisms?

Q: How is cell membrane repair coordinated among populations of cells at the tissue level?

SOURCE: "Cellular Mechanisms and Signals That Coordinate Plasma Membrane Repair." A. Horn and J.K. Jaiswal. Published by Cellular and Molecular Life Sciences July 26, 2018.