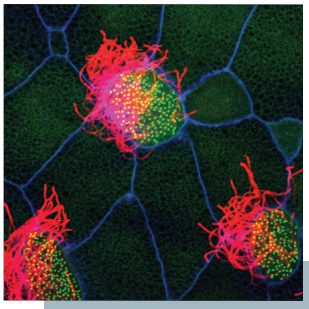

salk
Where cures begin.

Christopher Kintner

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The Problem

Throughout the body, tiny hairs called cilia help keep things moving in tubes and vessels. Cilia move eggs down the Fallopian tubes, push fluid through the brain and sweep dirt out of the lungs and ears. When cilia break down, everything from asthma to infertility to chronic ear infections can result. Being able to restore the function of damaged cilia could treat these diseases, but researchers don't know how cilia develop in the first place or how they coordinate their sweeping movements.

The Approach

Christopher Kintner uses cutting-edge genetic, biochemistry and microscopy techniques to study how cilia develop in an embryo and function in an adult. For much of his research, he relies on the African clawed frog, *Xenopus laevis*, because the frog's skin is coated with cilia and it's easy to watch the development of the cilia on the outside of the embryo's body. Through testing what mutations affect skin cilia, Kintner has discovered genes and proteins that are key to cilia development and function.

Kintner's findings have implications for patients with primary ciliary dyskinesia, a disorder resulting from an inherited genetic mutation that causes defects in the movement of cilia. The syndrome can cause infertility, due to the sluggish movement of eggs and sperm without the help of cilia, or respiratory symptoms, resulting from mucus and dirt accumulation in the airways. Being able to guide stem cells to develop cilia could help Kintner find ways to treat these symptoms.

The Innovations and Discoveries

- Kintner's group revealed the role of the gene FoxJ1 in the development of cilia. The team showed that the gene helps determine where motile cilia—those that have a sweeping motion—form, but doesn't have an effect on sensory cilia, used to aid the sense of touch.
- Kintner identified a second gene, called multicilin, that instructs specific cells when to develop many cilia. This discovery led to recent work showing that patients who lack ciliated cells in the lungs have mutations in multicilin. Multicilin could now be one factor used to coax stem cells to form new cilia to treat diseases.
- He also discovered a two-step mechanism that ensures that nearby cilia all beat in unison. To coordinate their movements, he found, cilia sense the direction of flow and align their movements accordingly.

For more information, please visit:
www.salk.edu/faculty/kintner.html

Birth Defects, Developmental Biology, Genetics, Neurobiology