

# Danish researchers expose new cause of life-threatening disease

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Danish researchers have just published findings that explain a previously unknown mechanism used by cells to communicate with one another. The research significantly contributes to understanding why some children are born with malformations and why children and adults may develop life-threatening diseases.

Dr. Søren Tvorup Christensen (Department of Biology) and Professor Lars Allan Larsen (Department of Cellular and [Molecular Medicine](#)) at the University of Copenhagen, in collaboration with colleagues in Denmark and France, have spearheaded the recent discovery which sheds new light on the causes of a range of debilitating diseases and birth defects.

## Antennae-like structures on the surface of cells

Over the years, the research group has been a leader in primary [cilium](#) research. Primary cilia are antennae-like structures found on the surface of nearly all [cells](#) in the human body. These antennae are designed to receive signals, such as growth factor and hormones, from other cells in the body and then convert these signals to a response within individual cells. Defective formation or function of these antennae can give rise to a range of serious maladies including heart defects, polycystic [kidney disease](#), [blindness](#), cancer, obesity and diabetes. However, there remains a great deal of mystery as to how these antennae capture and convert signals within cells.

The groundbreaking results have been published in *Cell Reports*, a prestigious scientific journal.

"We have identified an entirely new way by which these antennae are able to register signals in their midst, signals that serve to determine how cells divide and move amongst one another. This also serves to explain how a stem cell can develop into [heart muscle](#)," explains Søren Tvorup Christensen.

## Dr. Søren Tvorup Christensen

"What we have found is that the antennae don't just capture signals via receptors out in the antennae, but they are also able to transport specific types of receptors down to the base of the antennae - where they are then activated and might possibly interact with a host of other signalling systems. The receptors include the so-called Transforming Growth Factor beta (TGF?) receptors which have previously been associated with [birth defects](#) and cancer. Therefore, the base of the antennae can serve as a sort of control centre that coordinates the cell's ability to manage foetal development and the maintenance of organ function in adults."

## TGF? signalling and development of the heart

Lars Allan Larsen has numerous years of experience in heart development research. He adds "we know TGF? signalling is very important during heart development and that a failure in this system can lead to the congenital heart defects that affect roughly 1% of all newborns. Therefore, our discovery is a significant step towards demystifying the causes of congenital [heart defects](#)."

## Professor Lars Allan Larsen

The two researchers also point out that defective TGF?-signalling has been associated with neurodegenerative diseases such as Alzheimers, Parkinsons disease and mental retardation. Subsequently, the research group has begun studies on how these antennae - the primary cilia - regulate TGF?-signalling during, among other processes, the transformation of stem cells into nerve cells.

"It's definitely an area that will be attracting lots of attention in years to come. Globally, there is a great deal of interest in understanding why the antennae are so important for our health," concludes the pair of researchers.

Provided by University of Copenhagen

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