



Having the guts to make a difference

A functional intestinal system is essential for life but is also vulnerable to disease. Professor Helen Abud and her collaborators have devised an ingenious method of studying the specialised cells in the gut and what goes wrong when damage occurs or cancer is initiated.

Helen, who heads up the Epithelial Regeneration Laboratory at Monash University's Biomedicine Discovery Institute, uses cells obtained from patients to grow "mini-guts" in the laboratory.

These tiny tissue cultures, known as organoids, are a key component of her ongoing research into the role of stem cells in the development of the lining of the intestine.

The layer of cells that form the inner lining of the gut serves to prevent intestinal bacteria entering the rest of the body and potentially causing disease. It also absorbs useful nutrients.

With such a heavy workload, the life of an intestinal epithelial cell is unsurprisingly short. More than a billion cells are shed and then replaced every day.

"It is stem cells that are responsible for generating that layer," explains Helen.

"We know that most of the time that process goes very well, but sometimes things go wrong. This can result in loss of that layer, and the development of conditions such as inflammatory bowel disease, or an overproduction of cells, which can lead to bowel cancer."

Consequently, understanding the processes that influence the behaviour of the stem cells is a central focus of the laboratory.

"We've identified key signals that regulate stem cells and how quickly these cells can divide," says colleague Dr Thierry Jarde.

Exactly how the production of intestinal cells is regulated, concerns Thierry. This is key to understanding and finding new treatments for disease. Thierry conducts many of his studies using mini-guts.

"We believe that in colorectal cancer the cells divide very rapidly," he says. "Potentially, we could target the molecules that drive stem cell division in order to limit tumour growth."

Helen agrees.

"When we think of a tumour, the stem cells may be a minor population, but they are the driving force. This is like the seed, or the roots of a plant growing in our garden," she says.

"In developing a drug that is going to kill a tumour, we don't want to just kill the leaves of an unwanted plant or weed—we have to kill the roots, to prevent it growing back."

