


INTESTINAL TRACT

Sentinel goblet cells flush out bacteria from crypts

A novel cell type known as the sentinel goblet cell has been identified in the colonic crypt in a new study published in *Science*. These cells help to expel bacteria by stimulating a wave of mucus secretion from neighbouring crypt cells, and the cells themselves are then ejected into the intestinal lumen.

The intestine is protected by layers of mucus that defend the epithelium against the damaging inflammatory effects of bacteria. Goblet cells in the intestinal crypts manufacture, store and secrete proteins such as mucin-2 (encoded

by *MUC2*) that comprise the mucus layer.

The researchers examined mucus layer formation in intestinal explants from transgenic mice with fluorescently tagged human mucin-2, and found that microbial ligands of Toll-like receptor (TLR) induce mucin-2 secretion in a subpopulation of cells in the entrance to the crypts. TLR ligands were found to activate the inflammasome and the production of reactive oxygen species in sentinel goblet cells, which in turn trigger the release of Ca^{2+} ions that pass through gap junctions and stimulate mucin-2 release in neighbouring cells. Following this release, the team observed a clearance of bacteria surrounding the colonic crypts.

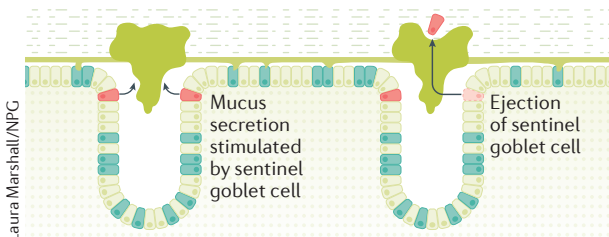
“These cells are like sentinels guarding the entrance to the crypt,” explains lead author George Birchenough. “As soon as they discover traces of bacteria in the crypt opening, it starts a chain reaction ending up in a violent

mucus explosion that washes away the bacteria.”

The researchers also observed that sentinel goblet cells are disposed of once their job is complete. “When the sentinel goblet cell is emptied it pushes itself out like a catapult,” remarks Gunnar Hansson, corresponding author for the study. Hansson also notes that ejection of the sentinel goblet cell leaves the intestinal crypt vulnerable to future bacterial invasion, which could be relevant to pathologies such as IBD.

The team are now studying sentinel goblet cells in patients with ulcerative colitis to determine whether enhancing this aspect of immune response at colonic crypts could present a future therapeutic target.

Charlotte Ridler



Mucus secretion and ejection of sentinel goblet cells in the intestinal crypt. Blue cells represent goblet cells, red cells represent sentinel goblet cells.

ORIGINAL ARTICLE Birchenough, G. M. H. *et al.*
A sentinel goblet cell guards the colonic crypt by triggering Nlrp6-dependent Muc2 secretion.
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