

## Journal club



### TURNING THE LIGHT ON

The early years of this century were heady days for innate immunity. The Toll-like receptors (TLRs) and other innate recognition moieties were being defined with molecular and structural detail, and Charlie Janeway's prescient prediction that pattern-recognition receptors are fundamental components of immunity was proved true, although unfortunately not before his untimely death. My excitement at these developments was only slightly perturbed by the realization that essential microbial structures, such as lipopolysaccharide (LPS) and peptidoglycan (PGN), contain elements that are shared by commensals and pathogens. This raised the possibility of innate immune recognition having basal roles in physiology beyond its role in host defence. Such a possibility was elegantly depicted on the cover of *Science* in November 2004, which

“the possibility of innate immune recognition having basal roles in physiology beyond its role in host defence”

showed the light organ of the juvenile Hawaiian bobtail squid being invaded by macrophage-like haemocytes during development after birth.

The light organ is a ciliated structure that moves seawater over the internal organ, ‘auditioning’ bacteria for symbiont mutualism, which is conferred by *Vibrio fischeri*. Light emission by luciferase-expressing *V. fischeri* is crucial for the life cycle of the nocturnal squid, which must hide its moonlit shadow from prey. Based on the emerging understanding of pattern recognition, Margaret McFall-Ngai and colleagues showed that the chemically specific LPS and PGN from *V. fischeri* synergistically induce phagocyte invasion of the juvenile light organ, leading to morphogenesis into the adult structure, which is colonized for life by this symbiont.

Although other investigators, including the Medzhitov laboratory (Rakoff-Nahoum *et al.*, 2004), had called attention to roles for TLRs in tissue homeostasis, the McFall-Ngai paper elegantly revealed the evolutionary drive underpinning

bacterial pattern recognition for proper commensalism, which is essential for tissue homeostasis and function. Indeed, these authors, with understated emphasis, point out that, rather than pathogen-associated molecular patterns (PAMPs), “a more general term, such as microbe-associated molecular patterns (MAMPs) would be more appropriate.” For me, the light clicked on. In many ways, this study presaged the spectacular growth of interest in the microbiota and the role of macrophages in tissue remodelling and function, which remain ‘hot’ areas of investigation today.

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**ORIGINAL ARTICLE** Koropatnick, T.A. *et al.* Microbial factor-mediated development in a host-bacterial mutualism. *Science* **306**, 1186–1188 (2004)  
**FURTHER READING** Rakoff-Nahoum, S. *et al.* Recognition of commensal microflora by Toll-like receptors is required for intestinal homeostasis. *Cell* **118**, 229–241 (2004)