**Survival of Salmonella inside activated macrophages – why bacteria will not understand the word NO?**

In the current issue of *Microbiology*, Dipshikha Chakravortty and colleagues (Das et al., 2009) provide insight into the molecular mechanisms that account for the persistence of the facultative intracellular pathogen *Salmonella* within the host phagocytes. It is well known that bacterial pathogens are able to manipulate cellular signalling, vesicle trafficking and the cytoskeleton to create a pleasant environment suiting their demands. For these wicked purposes, *Salmonella* wields strategic weapons, such as type III secretion systems, to inject persuasive protein effectors into the cytoplasm of the victim cells chosen as a home, namely enterocytes on our intestinal mucosa. *Salmonella* Typhimurium, the most studied among the multiple *Salmonella* enterica serovars, and a valid model for all of them, expresses two different type III secretion systems encoded by discrete pathogenicity islands (SPI-1 and SPI-2). The one encoded by SPI-2 is devoted to ensuring intracellular survival. For the bacterium, there are two scenarios that require intracellular survival: in the first scenario the bacterium chooses its host cell target, forcing its own internalization into non-professional phagocytes by making use of its SPI-1; in the second scenario the bacterium is chosen by a professional phagocyte that is duly programmed to eliminate it. The second setting is obviously less advantageous for the pathogen, because activated macrophages, the toughest enemies of *Salmonella*, will bring into play chemical weapons, such as nitric oxide (NO) among other items in the arsenal that is poured into maturing phagosomes. In their paper, Das et al. reveal that *Salmonella* uses the nitrite transporter NirC to quench NO production by NO synthase (iNOS) (Fig. 1). Since NO has a repressing effect on SPI-2 expression, this enhances the chances of bacterial cells to survive inside macrophages. The investigators have shown that NirC does indeed play a role in the virulence of *Salmonella* in an oral infection mouse model, and that such advantage is related to the effects of the nitrite transporter on iNOS products. Their results reveal a novel virulence determinant and provide a nice explanation for the relative resistance of *Salmonella* to oxidative stress in the phagosome.

**Fig. 1.** *Salmonella* says ‘no’ to NO.

---

**REFERENCES**


---

**Correspondence:** Victor J. Cid (vicjcid@farm.ucm.es)

**Complutense de Madrid, 28040 Madrid, Spain**

**Microbiology Comment** provides a forum for discussion of scientific issues arising directly from papers published in the journal. The authors of papers under discussion will be offered an opportunity to respond.

Guidelines on how to submit a *Microbiology* Comment article can be found in the Instructions for Authors at http://mic.sgmjournals.org

It should be noted that the Editors of *Microbiology* do not necessarily agree with the views expressed in *Microbiology* Comment.

**Charles J. Dorman, Editor-in-Chief**