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***Helicobacter pylori*: role of water on survival and transmission**

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The most important routes of transmission for *Helicobacter pylori* among the human population are not yet clearly identified. Since isolation of the bacterium outside the human host using standard culture techniques has been elusive so far, person-to-person (oral-oral, faecal-oral and gastro-oral) transmission is thought to be one of the most relevant pathways. However, environmental reservoirs, such as drinking water and associated biofilms, are thought to play a key role due to the subsistence of a viable but non-culturable (VBNC) form of the bacterium.

In order to elucidate this hypothesis, we have assessed the physiological state of water-exposed *Helicobacter* species, the ability of *H. pylori* to adhere on different surfaces and the development of a new molecular method based on PNA FISH technology. The PNA FISH method was applied for the direct detection of the bacterium, even on the VBNC state, and additionally it was adapted for biopsies samples and for the detection of antibiotic resistance.

We have demonstrated that the coccoid shape is in fact a manifestation of cell adaptation to non-optimum environments as the bacterium moves into a VBNC state. We also observed that the roles of water in transmission between hosts are likely to be similar for all *Helicobacter* spp.. Finally, the developed PNA FISH method proved to be very specific, sensitive and able to detect the bacterium even after the loss of cultivability.