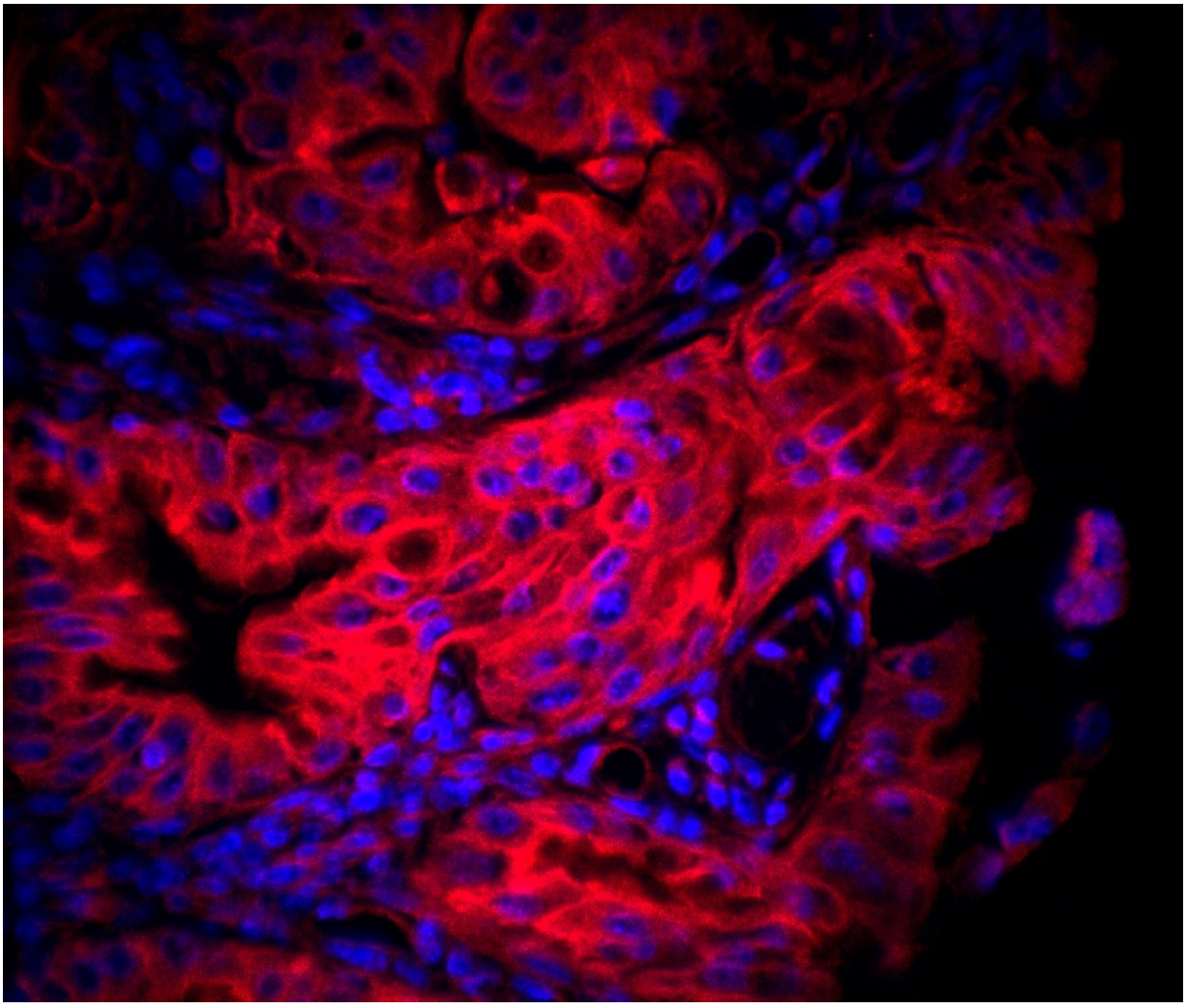
A new strategy used by Helicobacter pylori to target mitochondria

November 29 2017



Gastric tissue infected by *H. pylori*. Nuclei are in blue (Hoechst) and mitochondria in red (Mitotracker labelling). Credit: Laurent Chatre - CNRS/Institut Pasteur

Scientists from the Institut Pasteur and CNRS have recently identified new strategies used by Helicobacter pylori bacteria to infect cells. By specifically targeting mitochondria, these bacteria, despite being extracellular, can optimize infection in the host. These findings pave the way for new strategies to combat H. pylori infection, which is associated with most cases of gastric cancer and several other gastric disorders. The results were published on Nov. 21 in the journal *Scientific Reports*.

Helicobacter pylori is a bacterial pathogen that colonizes the stomach of approximately half of the world's population. Infection with H. pylori is acquired in childhood and lasts for decades. H. pylori is the main risk factor for gastric cancer and is linked to more than 80 percent of cases. Gastric cancer, the third most common cause of cancer-related death, often has poor prognosis because it tends to be diagnosed at an advanced stage. It is responsible for about 800,000 deaths each year worldwide.

H. pylori has several virulence factors that interact with specific targets in the cell and directly affect the severity of gastric disease. Vacuolating cytotoxin A (VacA) was previously the only main H. pylori factor known to act on mitochondria, causing cellular membrane and organelle dysfunction, ultimately leading to cell death.

Scientists from the Institut Pasteur and the CNRS have discovered that H. pylori uses at least two additional strategies to target mitochondria. These strategies do not lead to cell death, but maintain an environment that is conducive to bacterial proliferation.

Their results show that H. pylori affects both mitochondrial transport systems (used to transfer proteins into mitochondria) and the machinery for the replication and maintenance of the mitochondrial genome. The scientists also discovered that, contrary to what was previously believed,

VacA is not the only H. pylori component capable of affecting mitochondria. This suggests that the bacteria may produce other mitochondria-interacting factors that have not been yet identified.

Co-author Miria Ricchetti of the Institut Pasteur says, "The damage to mitochondria caused by H. pylori bacteria is temporary and disappears once the infection has been eliminated. Despite remarkably high levels of stress, mitochondria, like cells, can remain functional and withstand infection for longer than previously thought. It is important for us to bear this in mind when looking for strategies to inhibit the bacterium's pathogenic potential."

Co-author Eliette Touati of the Institut Pasteur, says, "We have observed in a mouse model that this type of damage is associated with a worsening of gastric lesions. The damage may therefore affect the chronicity and severity of infection by H. pylori. Understanding these new interactions between pathogen and host cells (via mitochondria) is vital for the development of effective strategies to combat H. pylori infection. The aim is to reduce the persistence of the bacteria in the stomach and curb associated conditions, especially cancer."

More information: Laurent Chatre et al, Helicobacter pylori targets mitochondrial import and components of mitochondrial DNA replication machinery through an alternative VacA-dependent and a VacA-independent mechanisms, *Scientific Reports* (2017). DOI: 10.1038/s41598-017-15567-3

Provided by Institut Pasteur

https://phys.org/news/2017-11-strategy-helicobacter-pylori-mitochondria.html