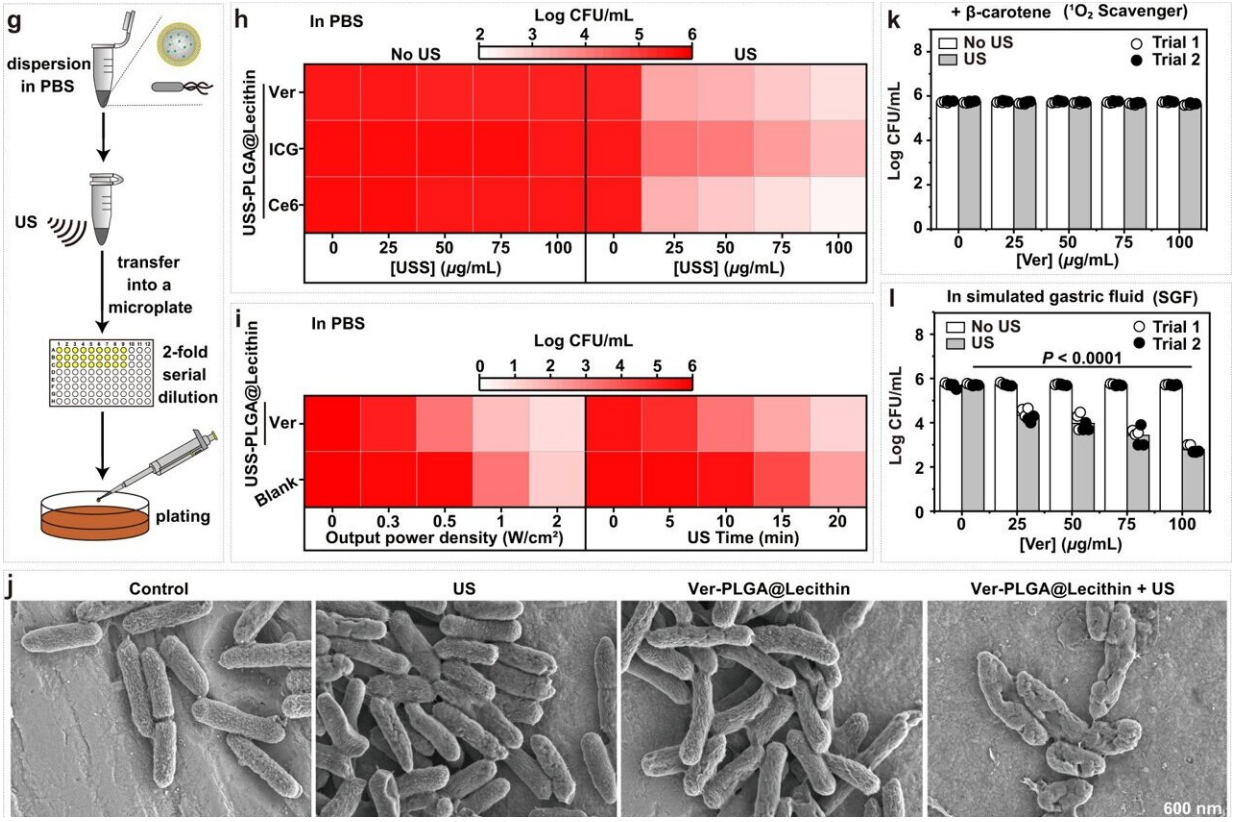
Research team develops nanoparticle-based sonodynamic therapy for H. pylori infection

March 1 2024



In vitro performances of the model nanosonosensitizers. Credit: *Nature Communications* (2024). DOI: 10.1038/s41467-024-45156-8

Helicobacter pylori (H. pylori) is a common pathogen that can be transmitted from person to person. Long-term H. pylori infection has

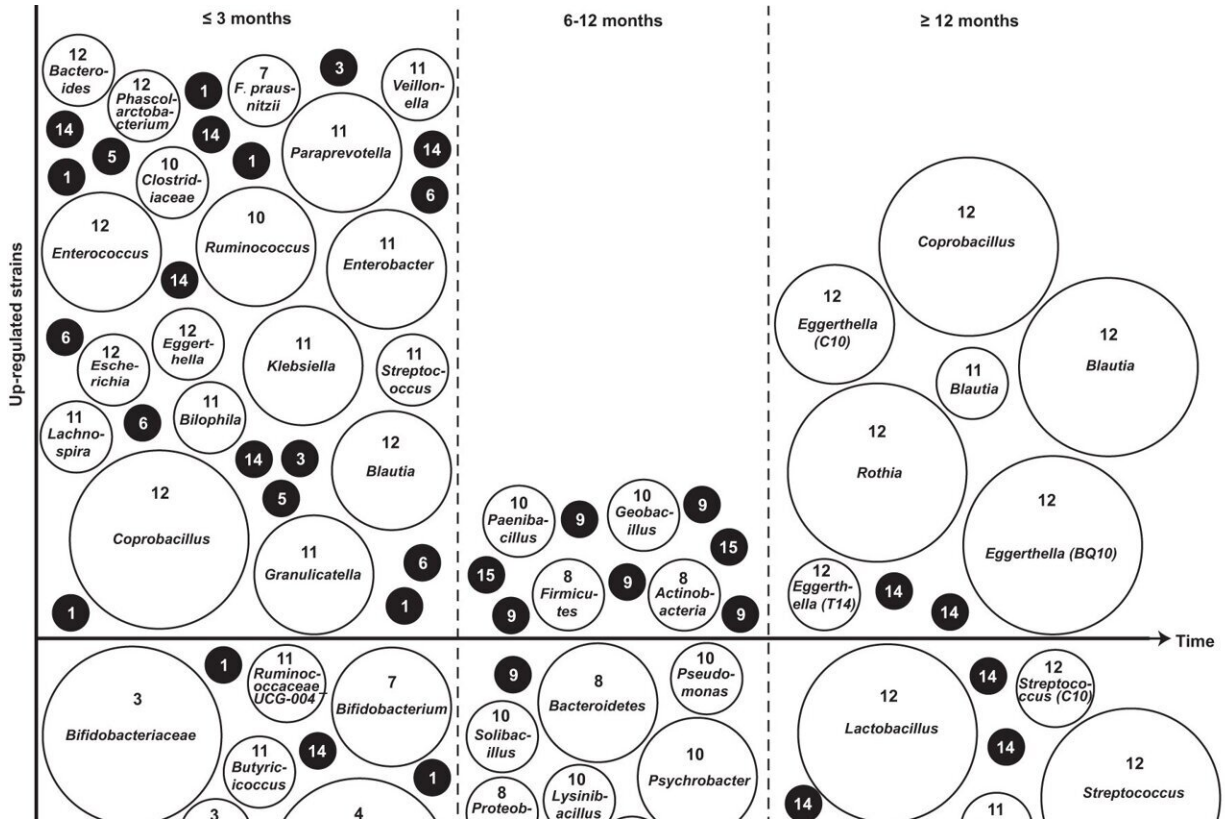
been recognized as a Class I human carcinogen. Currently, the standard clinical treatments for H. pylori infection (i.e., triple and quadruple therapy) rely on oral antibiotics to clear H. pylori from the stomach.

However, antibiotic resistance in H. pylori has led to an increase in the failure and recurrence rates of clinical treatments over the years. Oral antibiotics can lead to an imbalance of the intestinal flora. In addition, clinical standard therapies such as triple therapy ignore vacuolar toxin A, a vital virulence factor in H. pylori infection.

A research team led by Prof. Yang Lihua from Hefei National Research Center for Physical Sciences at the Microscale, the University of Science and Technology of China (USTC) of the Chinese Academy of Sciences, has developed a nanoparticle-based sonodynamic therapy to reduce H. pylori infection in mouse without disrupting gut microbiota. The study was published in Nature Communications.

The nanoparticles that mediate this sonodynamic therapy have been approved for clinical use and have dual efficacy in this therapy. The therapy neutralizes vacuolating cytotoxin A, a key virulence factor secreted by H. pylori, even without the presence of ultrasound.

When combined with an ultrasound exposure dosage that meets the criteria for the use of ultrasound medical devices, it kills H. pylori through the production of reactive oxygen species, offering the possibility of addressing antimicrobial drug resistance.



Up- and down-regulated human gut commensal bacterial strains after antibiotic-based H. pylori eradication therapies. Each circle, whether solid black or hollow white, represents a gut commensal bacterial strain that has been reported to experience a change in abundance after antibiotic-based *H. pylori* eradication treatment, and the number enclosed within the circle corresponds to the relevant reference, which can be located in the reference list provided at the bottom right. A solid black circle represents a commensal bacterial strain for which the relevant reference did not report the *P* value pertaining to its change of abundance in the host gut after antibiotic-based *H. pylori* eradication treatment. The hollow white circles represent commensal bacterial strains, for which the relevant references have provided *P* values pertaining to their changes of abundance in the host gut after antibiotic-based treatment for *H. pylori* eradication, and the sizes of these white circles progressing from smallest through medium to largest correspond to *P* values of

Citation: Research team develops nanoparticle-based sonodynamic therapy for H. pylori

infection (2024, March 1) retrieved 27 April 2024 from https://phys.org/news/2024-03-team-nanoparticle-based-sonodynamic-therapy.html