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## Response of *Escherichia coli* to hydrogen nanobubbles: an in vitro evaluation using synchrotron infrared spectroscopy

Key words: Hydrogen Nanobubbles, Synchrotron Infrared Spectroscopy, *Escherichia coli* 

## **Research Summary**

This correspondence mainly reported response of *Escherichia coli* to Hydrogen Nanobubbles. Molecular hydrogen mainly induces the cellular changes in protein and fatty acid compositions *in vitro*.



- a. H<sub>2</sub> nanobubbles treated bacteria
- b. FTIR spectra of bacteria
- c. Principle component analysis

## Innovation points

- The response of Escherichia coli to Hydrogen Nanobubbles was evaluated using synchrotron infrared spectroscopy.
- The protein and fatty acid composition of the cells changed greatly, and the nucleic acid and polysaccharide composition did not change significantly after hydrogen nanobubble treatment.
- The cellular mechanism of hydrogen molecule and/or nanobubble is beyond being an antioxidant.

## Innovation points

A series of spectrograms showed the changes in bacterial composition before and after hydrogen nanobubble treatment based on synchrotron radiation infrared spectroscopy.

Figure 1 The effect of hydrogen nanobubbles (NBs) on *E. coli.* 

Figure 2 NBs-induced chemical component changes of E. coli, as characterized by FTIR spectroscopy.

Figure 3 The distinct biological effects between H<sub>2</sub> NBs and tannins on *E. coli.*