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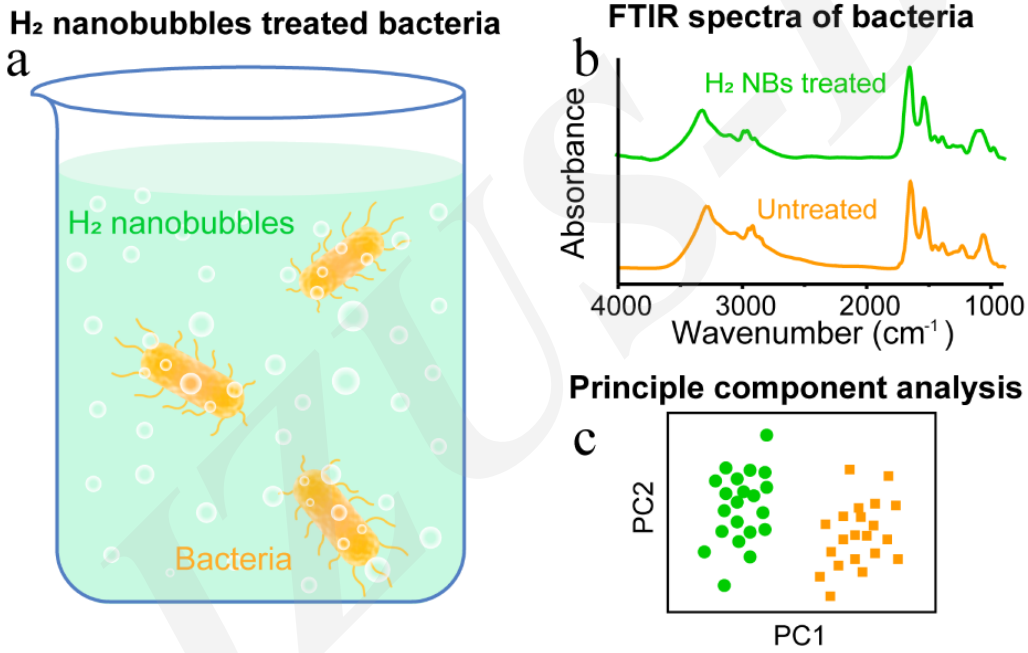
Response of *Escherichia coli* to hydrogen nanobubbles: an in vitro evaluation using synchrotron infrared spectroscopy

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_2 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.**

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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_2 NBs and tannins on *E. coli.*

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