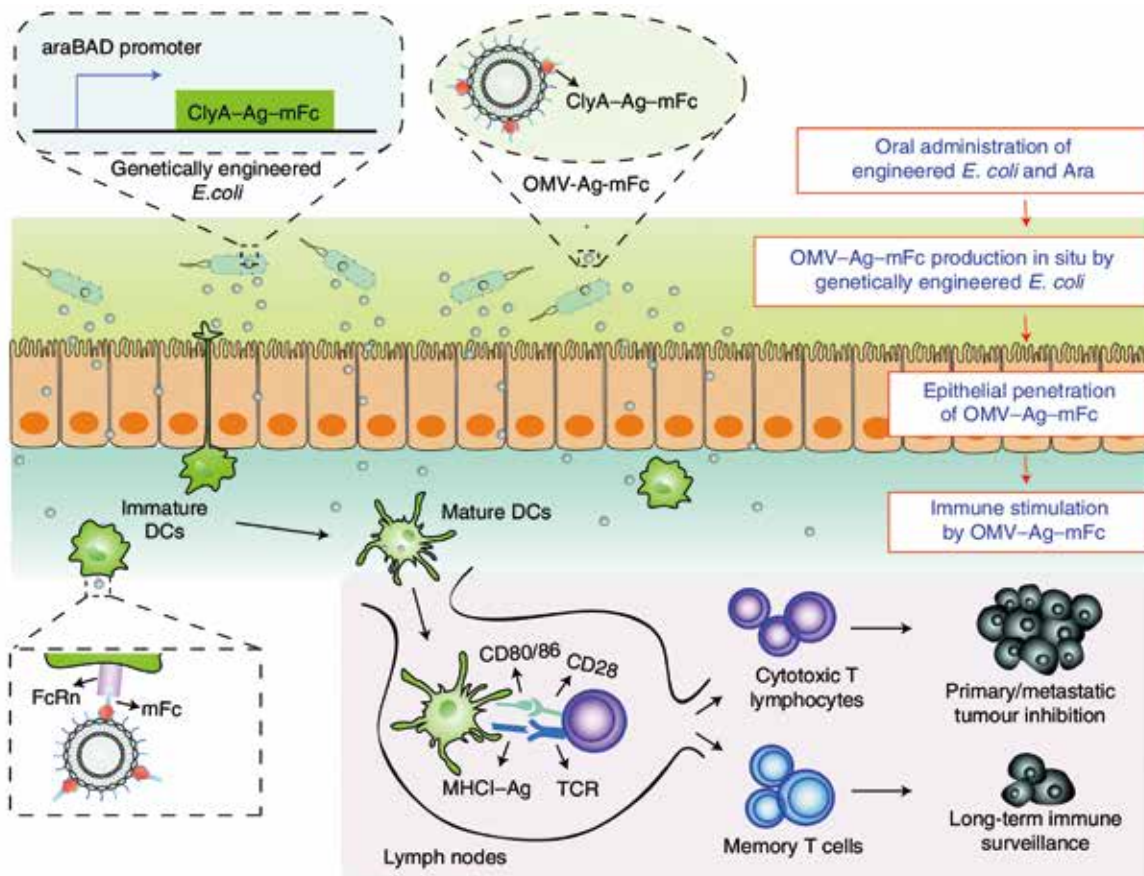


# Engineering Bacteria into Oral Tumor Vaccines

By YAN Fusheng (Staff Reporter)

Humans have a long history of using tools to make good use of their environment to accomplish tasks. As one of most creative populations, scientists continuously explore new strategies to fight diseases by borrowing the wisdom of other organisms. Here is another example.



Scientists transformed E. Coli, one of the most common bugs in the human gut, into an oral tumor vaccine. (Credit: *Nature Biomedical Engineering*)

As reported in the May 2 issue of *Nature Biomedical Engineering*, a team led by NIE Guangjun and ZHAO Xiao from the National Center for Nanoscience and Technology of the Chinese Academy of Sciences may have found a game-changing solution for delivering oral tumor vaccines. They innovatively resort to genetically engineered *E. coli*, one of the most abundant commensal bacteria in the gut, to pull the trick.

Tumor vaccines, which use specific genetic mutations within a tumor to activate immune cells called cytotoxic T-cell lymphocytes (CTLs) to attack the tumor cells, have traditionally been administered through injection. However, these methods have limited effectiveness due to the limited distribution of immune cells in muscle tissue and the subcutaneous layer. As a result, adjuvants are often required to improve the immunogenicity of these vaccines, complicating the vaccine administration.

An alternative option is oral administration, as the intestine contains most of the body's immune cells.

Oral administration generally has a better safety profile, better patient compliance, and lower costs. However, oral tumor vaccines have been limited due to the challenges posed by the gastrointestinal environment and intestinal epithelial barriers.

In the study, the researchers used outer membrane vesicles (OMVs) to deliver an oral tumor vaccine targeting colon cancer. OMVs are natural nanoparticles released by gut bacteria. They can penetrate the intestinal epithelial barriers and interact with immune cells in the lamina propria, including dendritic cells.

The researchers used genetically engineered *E. coli*, capable of secreting antigen-carrying OMVs, and administered them orally to mice with colon cancer. The results showed that the vaccine was able to stimulate the immune system and slow the growth of the tumors.

This innovative approach using OMVs as a delivery mechanism for oral tumor vaccines has the potential to be a safer and more efficient alternative to current methods. It is an exciting development in the field of cancer immunotherapy.

#### Reference

Yue, Y., Xu, J., Li, Y., et al. (2022). Antigen-bearing outer membrane vesicles as tumour vaccines produced in situ by ingested genetically engineered bacteria. *Nature Biomedical Engineering*, 6(7), 898-909. doi:10.1038/s41551-022-00886-2