

Restore Gut Homeostasis by New Way of Antibiotics Delivery

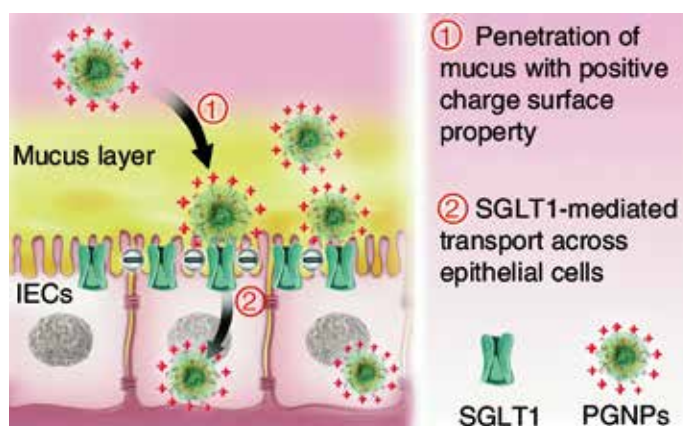
By YAN Fusheng (Staff Reporter)

Taking antibiotic pills is a common and effective way to treat bacterial infections. However, the antibiotics can reach the colon and cause problems with the microbes that live there, known as the gut microbiome. As a result, one may experience unpleasant side effects, such as diarrhoea, bloating and gas, because the antibiotics would also indiscriminately kill the ‘good’ bacteria that side with us.

In a new study published in *Nature Biomedical Engineering* on July 7, researchers from the University of Science and Technology of China (USTC) found a way to improve the absorption of antibiotics in the small intestine while sparing one from the unpleasant side effects (doi: 10.1038/s41551-022-00903-4).

The researchers created capsules made of tiny particles, namely positive glucosylated nanoparticles (PGNPs), that are positively charged and coated with a sugar-like substance. By targeting the small intestine’s sodium-dependent glucose transporter 1 (SGLT1), a receptor that ferries glucose and other sugars from the lumen of the intestine into the cells, these capsules can improve the bioavailability of the antibiotics, meaning that more of the medication is absorbed into the body and able to reach the site of infection.

The enhanced absorption improved the effectiveness of the antibiotics and reduced their negative impact on the gut microbiome. When given to mice with lung infections, the capsules eliminated the infections and protected against other problems caused by disruptions



Following oral administration, positively charged and glycosylated nanoparticles, namely PGNPs, can cross the intestinal barrier and enter the lining cells through SGLT1-mediated transport. (Image by USTC)

in the gut microbiome. The co-administration of an SGLT1 inhibitor (iSGLT1) with the capsules showed a large disturbance and a slow recovery, suggesting glucose transporter SGLT1 is essential for enhanced efficacy in terms of clearance of bacterial pathogens.

Overall, this new delivery method helps reduce the negative effects of oral medications on the gut microbiome and improves their effectiveness. Additionally, this new way of delivering antibiotics would also help reduce the exposure of the antibiotics to gut bacteria and lower the accumulation of antibiotic-resistant genes. All these benefits are important for sustaining or restoring gut homeostasis.

Reference

Zhang, G., Wang, Q., Tao, W., et al. (2022). Glucosylated nanoparticles for the oral delivery of antibiotics to the proximal small intestine protect mice from gut dysbiosis. *Nature Biomedical Engineering*, 6(7), 867-881. doi:10.1038/s41551-022-00903-4