Practical nanozymes discovered to fight antimicrobial resistance

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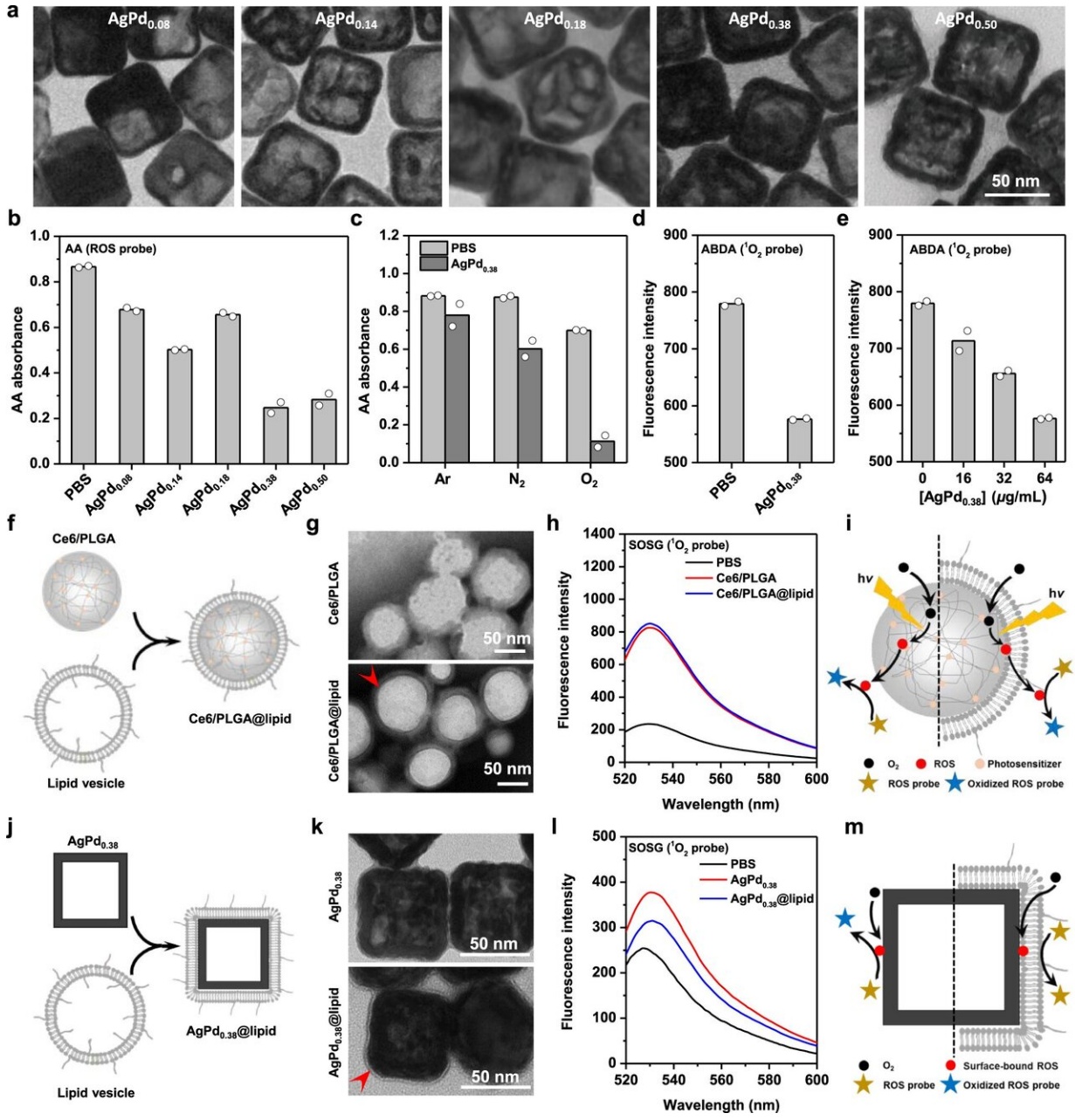

Fig. 1: Oxidase-like AgPd0.38 generates surface-bound ROS. Nature Communications ISSN 2041-1723 (online)

Nanozymes, a group of inorganic catalysis-efficient particles, have been proposed as promising antimicrobials against bacteria. They are efficient in killing bacteria, thanks to their production of reactive oxygen species (ROS).

Despite this advantage, nanozymes are generally toxic to both bacteria and mammalian cells, that is, they are also toxic to our own cells. This is mainly because of the intrinsic inability of ROS to distinguish bacteria from mammalian cells.

In a study published in *Nature Communications*, the research team led by Xiong Yujie and Yang Lihua from University of Science and Technology (USTC) of the Chinese Academy of Sciences (CAS) proposed a novel method to construct efficient-while-little-toxic nanozymes.

The researchers showed that nanozymes that generate surface-bound ROS selectively kill bacteria, while leaving the mammalian cells safe.

The selectivity is attributed to, on the one hand, the surface-bound nature of ROS generated by the nanozymes prepared by the team, and on the other hand, an unexpected antidote role of endocytosis, a cellular process that is common for mammalian cells while absent in bacteria.

Moreover, the researchers observed a few different nanozymes that generate surface-bound ROS but vary in chemical components and in physical structures, ending up finding that the anti-bacteria behaviors are

similar. This fact brings to the conclusion that the advantage of selectively killing bacteria over mammalian cells is the general property of the nanozymes that produce surface-bound ROS.

Antimicrobial resistance (AMR) poses a threat to global health, which is the reason why our use of drugs against germs are gradually less effective.

More information: Feng Gao et al. Surface-bound reactive oxygen species generating nanozymes for selective antibacterial action, *Nature Communications* (2021). DOI: 10.1038/s41467-021-20965-3

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