The Auto-Detoxifying Mechanisms of Cancer-Selective Killing Iron/Gold Nanoparticles

Ya-Na Wu¹, Li-Xing Yang², Wu-Chou Su¹, Dar-Bin Shieh¹*, and Filip Braet⁴*

¹Institute of Oral Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
²Institute of Basic Medical Sciences, National Cheng Kung University, Tainan, Taiwan.
³Department of Internal Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
⁴Australian Centre for Microscopy & Microanalysis, University of Sydney, New South Wales, Australia

*Email: yana.wu@gmail.com

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Recently, gold coated iron nanoparticles (Fe@Au) have attracted great scientific interests due to their anti-proliferative properties that are specifically directed towards cancer cells (1-3), and therefore Fe@Au are proposed as a novel anti-cancer agent. In this study, we investigate how the structure of Fe@Au affect the observed anti-cancer properties. Firstly, transformation and oxidation status of Fe@Au upon in vitro and in vivo treatments was analyzed with transmission electron microscopy, energy-dispersive X-ray spectroscopy and X-ray diffraction. We found that the outer gold shell could be disrupted under aqueous environment which lead to the iron cores being exposed. Furthermore, the anti-cancer property of Fe@Au was diminished and the uniformity in morphology was lost in the process of oxidation. In summary, thin layer of Au coatings of Fe@Au were served as the capsules to delay the oxidation of the Fe core and to preserve their cytotoxicity. The selective anti-cancer cell properties of Fe@Au are associated with the zero-valent Fe core status. These discoveries will lead the basic findings to the future practical clinical applications.

REFERENCES


Figure. The upper scheme is the mechanism and related structure of Fe@Au upon the process of treatment and self-metabolised. The lower figures are TEM of Fe@Au at different stages.