Water-Soluble Cationic Porphyrins for MRI

Ç. Çelik[1], Y. Yamakoshi[1]*

[1]Department of Chemistry and Applied Biosciences, ETH Zürich, Vladimir-Prelog-Weg 3, 8093 Zürich, Switzerland

Magnetic resonance imaging (MRI) is a non-invasive imaging modality that provides in depth images of tissue with high resolution. In the presence of contrast agents (MRI-CA), MRI images can be greatly enhanced. However, FDA-approved Gd(III)-based contrast agents can occasionally reveal serious side effects, especially in patients with kidney defects. Therefore, safer MRI-CAs are of high demand. Recently, we have reported a water-soluble Gd(III)-porphyrin molecule as a photosensitive MRI-CA[1]. Although we have successfully increased the stability of Gd(III)-porphyrin complexation, it is ideal to have an even more stable chelate for MRI-CAs. Therefore, Mn(III) has been attracting attention as a suitable replacement for Gd(III) in MRI-CAs.

In this study, two types of porphyrins were synthesised as ligands for the MRI-CAs. The synthesised porphyrins are highly soluble in water and show no significant aggregation at physiological pH. By ESR spin-trapping method, efficient reactive oxygen generation was observed under visible light irradiation. Complexation of Mn(III) to the porphyrin centre provided a stable Mn(III)-porphyrin complex—observed by UV-Vis absorption spectra and HR-ESI-MS—presumably due to the smaller ionic radii of Mn(III) which can be placed in the centre of porphyrin without pyramidalisation. Currently, both DNA binding activity and relaxivity of the prepared Mn(III)-porphyrins are under investigation.

[1] Tamas Nemeth, Naoko Yoshizawa-Sugata, Agnes Pallier, Youichi Tajima, Yue Ma, Éva Tóth, Hisao Masai, Yoko Yamakoshi, *Chemical & Biomedical Imaging*, **2023**, 1, 157.