Radiopharmaceuticals are a class of compounds that combine radioactive isotopes within an organic framework known as a bifunctional chelator. As can be implied from its name, a bifunctional chelator has two main functions: to tightly bind a radioactive metal and deliver it to a desired site using a targeting vector. They are powerful agents in diagnostic imaging and targeted cancer therapy. The main challenge is finding a perfect combination of radioactive isotope and a bifunctional chelator. Minor changes in metal size and atomic composition of the chelator can have drastic effects on radiolabelling conditions, stability of the chelator-isotope complex and its biodistribution. If the chelator is not optimal for a particular metal, it can result in the loss of the radioisotope in vivo, which will damage healthy tissues. Our goal is to explore the synthesis of two novel bifunctional chelators - Noctapa and H4-py4pa - and study the properties of their metal complexes with $^{212}$Pb, $^{225}$Ac and $^{227}$Th. These radioactive metals are excellent candidates for use in targeted cancer therapy. Having customized bifunctional chelators can improve targeting potential and diminish side effects resulting from the loss of the metal from the bifunctional chelator. We are expecting that these novel chelators will have faster radiolabelling under mild conditions and form more stable complexes with $^{212}$Pb, $^{225}$Ac and $^{227}$Th compared to the go-to bifunctional chelators currently used with these metals. So far, H4-py4pa have demonstrated fast and quantitative radiolabeling with both $^{225}$Ac and $^{227}$Th at room temperature, with excellent in vitro stability.

Themes:

Check (highlight) the most applicable theme according to the abstract.

| Innovation and Technology | Health and Wellness | Culture and Society | Sustainability and Conservation |

Comments: Thorough but concise explanation of a tricky topic – well done! All the best at MURC!