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## Creative Chemistry and Cyclotrons: Training students and expanding the toolbox of PET radionuclides

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With the expansion of approved  $^{18}\text{F}$  based agents for medical imaging using positron emission tomography (PET), low energy (11-24 MeV) cyclotrons are now used at many commercial and academic centers to produce isotopes for medical imaging. The energy of these machines is ideal for isotope production via (p,n), (p, $\alpha$ ) and in some cases (p,2n) reactions. These sites also provide ideal training grounds for the next generation of nuclear and radiochemists. Using the UAB TR24 cyclotron, our group has focused on the development of reaction routes, target materials and the separation chemistry of isotopes to expand the toolbox of nuclear imaging agents. These have included transition metals such as  $^{52}\text{Mn}$ ,  $^{55}\text{Co}$ ,  $^{89}\text{Zr}$ ,  $^{43,47}\text{Sc}$  and  $^{45}\text{Ti}$ . Additional research has developed chemistry to incorporate these isotopes into new imaging radiopharmaceuticals for preclinical or clinical research. In particular, our group has been exploring the use of  $^{89}\text{Zr}$  radiolabeled antibodies for imaging of cell surface receptor expression in preclinical models and in clinical trials of metastatic breast cancer patients. Recent work has also resulted in new radiochemistry techniques for the development of new  $^{43,47}\text{Sc}$  and  $^{45}\text{Ti}$  radiopharmaceuticals for oncologic applications.

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