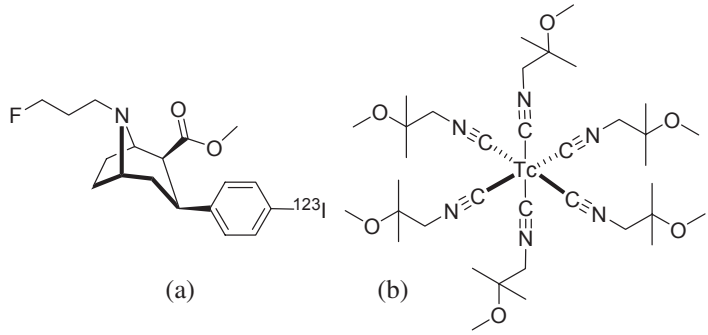

FIGURE 10.4 (a) DaTSCAN® (Ioflupane (^{123}I)) (b) Cardiolite® (Technetium (^{99m}Tc) sestamibi).

of the body or pharmacological events. DaTSCAN® (Ioflupane (^{123}I), Figure 10.4(a)), for example, is used in the diagnosis of Parkinson's disease based on its high affinity for the dopamine transporter (DAT) in the striatal region of the brain.[31] Cardiolite® (Technetium (^{99m}Tc) sestamibi, Figure 10.4(b)), on the other hand, incorporates a metastable Technetium atom and is routinely used for the visualization and diagnosis of cardiovascular problems.[32]

The merging of SPECT imaging techniques with antibody technology lead to the development of Prostascint (indium (^{111}In) capromab pendetide), a monoclonal antibody labeled with ^{111}In, for the identification of prostate cancer. In this case, the antibody specifically targets the prostate specific membrane antigen in prostate cancer cells, but not normal prostate cells.[33] It is worth noting at this point that SPECT imaging resolution is not as high as PET imaging. PET imaging is approximately 2–3 orders of magnitude more sensitive than SPECT imaging, and as a result, SPECT images typically have a lower image resolution than the corresponding PET images.[34]

In considering the application of both PET and SPECT imaging technologies, it is important to consider the nature and availability of an appropriate radioligand. As discussed above, PET ligands require special synthetic techniques, equipment, and dedicated equipment as a result of their radioactive nature. Similar limitations are also an issue with SPECT ligands, as they are also radioactive. There are, however, additional issues that must be addressed in order to develop a radioligand. It may not be possible to incorporate a radioisotope in a candidate compound that is selected for clinical study, as synthetic challenges are insurmountable. In this case, it may be possible to choose a structurally related compound that can serve the same purpose. The irreversible monoamine oxidase-B inhibitor Azilect® (Rasagiline, Figure 10.5(a)), for example, is useful for the treatment of early stage Parkinson's disease, but the synthesis of a