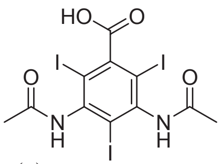
Exploratory, invasive techniques are available to assess disease progression, and could be used to monitor the impact of a candidate compound on a wide array of disease states, but this would be impractical, expensive, and in most cases unethical. There are, however, a number of imaging technologies that make it possible to peer into the body in a non-invasive manner and create three-dimensional images of the inside of the body with a high degree of contrast (e.g., organs, bones, vasculature, and other systems distinguishable from each other). These methods have provided a wealth of understanding of how the body works, diagnostic techniques, and within the context of drug discovery and development, novel tools capable of monitoring disease progression and the impact of candidate compounds on therapeutic targets. The most commonly used imagining techniques are X-ray computed tomography (X-ray CT), positron emission tomography (PET), single-photon emission computed tomography (SPECT), magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), and ultrasound techniques.

X-ray computed tomography, more commonly referred to as X-ray CT or CAT scan (computed axial tomography scan), is perhaps the most commonly used imaging technology. This technique depends upon the differential attenuation of X-rays as they pass through different types of tissue. As with single X-ray images, highly mineralized tissues such as bones have a brighter intensity in this technique due the higher degree of attenuation of X-rays, while softer tissue (e.g., muscles, skin, vasculature, connective tissue) are illuminated to a lesser degree due to their lower attenuation of X-rays. In this imaging technique, a series of two-dimensional radiographic images are taken around a single rotational axis of the subject. The individual two-dimensional "slices," also referred to as tomograms, provide a cross-sectional view of the subject, much like removing a piece of bread from a loaf of bread provides a cross-sectional view of the loaf of bread. Three-dimensional images can be created by combining the two-dimensional "slices" using digital geometry processing, allowing scientist to non-invasively observe the inside of the body. In some cases, contrast agents, such as Hypaque® (Diatrizoic acid), and Ioxilan® (Oxilan) (Figure 10.2(a) and (b)) can be employed to enhance visualization of specific areas of the body based on their propensity to accumulate in specific regions.


(a)

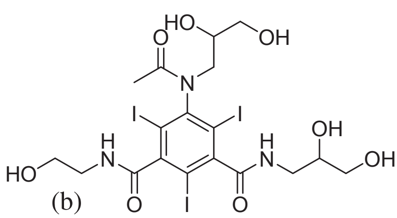

(b)

FIGURE 10.2 (a) Hypaque® (Diatrizoic acid) (b) Ioxilan® (Oxilan).