Disease as Dissonance

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The practice of medicine is still based largely on attempts to attribute diseases to specific organs, but more and more modern medicine is moving beyond gross and histopathology into the domain of molecular medicine, and no specialty is better able than nuclear medicine to contribute to the transition. By its ability to measure regional physiology and regional biochemistry in all organs of the body, the domain of nuclear medicine encompasses the organs, cells and molecules of the entire human body. Measurements of the dynamic state of body constituents, bioenergetics and inter- and intra-cellular communication provide a whole new approach to patient care. Intercellular communication within the body has become as important a focus of modern medicine as computer networks have become in modern society.

Just as diagnosis can be based on regional physiology and biochemistry, so also can the effectiveness of treatment be measured by the same procedures. Such measurements of effectiveness are not only objective and quantitative, but can be made immediately after treatment is started. Nuclear medicine can provide new images of disease, not just new tests for old diagnoses. Many patients with the same diagnosis, such as Parkinsonism, or even cancer, can be shown to differ in their regional biochemical and physiological manifestations of disease. Even cancers with similar histopathological characteristics, such as islet cell tumors of the pancreas, can be differentiated according to whether they do or do not manifest an avid accumulation of deoxyglucose, express somatostatin or other receptors, or contain p-glycoprotein, an important factor in the development of multidrug resistance to chemotherapeutic agents, and response to chemotherapy. By means of radiotracer methods, we can now define cancer as a failure of the molecular processes that keep us from getting cancer. Nuclear medicine can provide new images of disease, not just new tests for old diagnoses.

Cell membrane and intracellular receptors have become a major domain of nuclear medicine, involving neurotransmitters, hormones, growth factors, and cytokines controlling cellular behavior. Measuring these receptors in different parts of the body with radiotracers makes it possible to characterize diseases as failures in communication—“disease as dissonance.”