

IMPORTANCE OF INTERCELLULAR COMMUNICATION: AN INTRODUCTION TO BASIC CONCEPTS

For a multicellular organism to survive and function effectively, its component cells must act in a coordinated fashion. Such coordination requires the transfer of information between cells in widely separated parts of the organism. In most higher animals there are two major pathways, or systems, of intercellular communication: the endocrine system and the nervous system.

In the endocrine system, specialized glandular cells secrete hormones, which are carried in the *bloodstream* to all parts of the body, but only influence the activity of specifically responsive *target cells*, i.e., those with the appropriate receptor molecules. This is like a *TV transmission system*, which sends its signal everywhere, but which is only picked up by those receivers tuned to its particular channel. The endocrine system is a diffuse, fairly slow, but long-effect communication system.

In the nervous system, sensory receptor cells and a network of nerve cells with elongated processes communicate with one another and with muscles and glands by secreting neurotransmitters directly onto specific receiving cells. This is like a *telephone communication system*, with its direct wiring between specific locations. The nervous system is a relatively non-diffuse, fast acting, but usually short-effect communication system. This permits *patterns* of communication to signify specific rapid sequences of sensory events, and to produce specific rapid sequences of motor activity.

It should be noted that several chemicals, such as noradrenalin, serve as *both hormones and neurotransmitters or neuromodulators*. The latter are functionally similar to hormones in their actions, i.e., they modulate other chemical events and have long effects, but they are produced and act in the nervous system. Another interesting interrelationship is that the *adrenal medulla gland* appears to be a collection of sympathetic nervous system cells functioning like an endocrine gland. Moreover, the *hypothalamus* of the brain manufactures the two hormones of the posterior pituitary and also regulates secretion of the hormones produced by the anterior pituitary. Hence the hypothalamus of the brain regulates the master endocrine gland, the pituitary, and what we really have is a neuroendocrine system.