Endocrine system

The nervous system sends electrical messages to control and coordinate the body. The endocrine system has a similar job, but uses chemicals to “ communicate”. These chemicals are known as hormones. A hormone is a specific messenger molecule synthesized and secreted by a group of specialized cells called an endocrine gland. These glands are ductless, which means that their secretions (hormones) are released directly into the bloodstream and travel to elsewhere in the body totarget organs, upon which they act. Note that this is in contrast to our digestive glands, which have ducts for releasing the digestive enzymes.

Pheromones are also communication chemicals, but are used to send signals to other members of the same species. Queen bees, ants, and naked mole rats exert control of their respective colonies via pheromones. One common use for pheromones is as attractants in mating. Pheromones are widely studied in insects and are the basis for some kinds of Japanese beetle and gypsy moth traps. While pheromones have not been so widely studied in humans, some interesting studies have been done in recent years on pheromonal control of menstrual cycles in women.

It has been found that pheromones in male sweat and/or sweat from another “ dominant” female will both influence/regulate the cycles of women when smeared on their upper lip, just below the nose. Also, there is evidence that continued reception of a given man’s pheromone(s) by a woman in the weeks just after ovulation/fertilization can significantly increase the chances of successful implantation of the new baby in her uterus. Pheromones are also used for things like territorial markers (urine) and alarm signals. Each

hormone’s shape is specific and can be recognized by the corresponding target cells.

The binding sites on the target cells are called hormone receptors. Many hormones come in antagonistic pairs that have opposite effects on the target organs. For example, insulin and glucagon have opposite effects on the liver’s control of blood sugar level. Insulin lowers the blood sugar level by instructing the liver to take glucose out of circulation and store it, while glucagon instructs the liver to release some of its stored supply to raise the blood sugar level. Much hormonal regulation depends on feedback loops to maintain balance and homeostasis.

There are three general classes (groups) of hormones. These are classified by chemical structure, not function. * steroid hormones including prostaglandins which function especially in a variety of female functions (aspirin inhibits synthesis of prostaglandins, some of which cause “ cramps”) and the sex hormones all of which are lipids made from cholesterol, * amino acid derivatives (like epinephrine) which are derived from amino acids, especially tyrosine, and * peptide hormones (like insulin) which is the most numerous/diverse group of hormones.

The major human endocrine glands include:

1. the hypothalamus and pituitary gland The pituitary gland is called the “ master gland” but it is under the control of the hypothalamus. Together, they control many other endocrine functions. They secrete a number of hormones, especially several which are important to the female menstural cycle, pregnancy, birth, and lactation (milk production).

2. the thyroid gland Thyroid hormones regulate metabolism, therefore body temperature and weight. The thyroid hormones contain iodine, which the thyroid needs in order to manufacture these hormones.

3. the pancreas This organ has two functions. It serves as a ducted gland, secreting digestive enzymes into the small intestine. The pancreas also serves as a ductless gland in that the islets of Langerhans secrete insulin and glucagon to regulate the blood sugar level.

4. the adrenal glands These sit on top of the kidneys. They consist of two parts, the outer cortex and the inner medulla. The medulla secretesepinephrine (= adrenaline) and other similar hormones in response to stressors such as fright, anger, caffeine, or low blood sugar.

5. the gonads or sex organs In addition to producing gametes, the female ovaries and male testes (singular = testis) also secrete hormones. Therefore, these hormones are called sex hormones. The secretion of sex hormones by the gonads is controlled by pituitary gland hormones such as FSH and LH. While both sexes make some of each of the hormones, typically male testes secrete primarily androgens including testosterone the pineal gland This gland is located near the center of the brain in humans, and is stimulated by nerves from the eyes. In some other animals, the pineal gland is closer to the skin and directly stimulated by light (some lizards even have a third eye). Local regulators are hormones with target cells nearby or adjacent to the endocrine gland in question. For example, neurotransmitters are secreted in the synapses of our nervous system and their target cells are in the same synapses.