

Timeline of Physiology

Endocrinology & Metabolism

1689 Richard Morton provides the first description of the eating disorder, *anorexia nervosa*, characterized most commonly in young females by their food refusal and extreme, life-threatening emaciation.

1840-50 Claude Bernard performs studies on the production and storage of glucose by the liver. The glycemic function of the liver becomes the first example of an "internal secretion." He also performs the first studies on the central nervous system control of glucose homeostasis.

1898 Robert Tigerstedt and Per Bergmann discover renin, the active substance in kidney extract. They are able to produce hypertension by injecting rabbits with the extract and demonstrate for the first time that the kidney is an endocrine organ.

1902 Ernest Starling and William Bayliss discover that the small intestine produces secretin, a substance that stimulates the pancreas. They introduce the concept of a "hormone" from the Greek word meaning "I excite."

1909 Emil Kocher receives the Nobel Prize for his research on the thyroid gland, which leads to the successful surgical treatment of goiter.

1914 Edward Kendall isolates thyroxine, the active hormone of the thyroid gland, and shares the 1950 Nobel Prize with Tadeus Reichstein and Philip Hench for discoveries relating to the structure and biological effects of adrenal cortical hormones.

1920s Herbert Evans and Joseph Long describe the relationship between the anterior pituitary gland and growth, leading to an explanation for dwarfism and gigantism.

1920s Physiologists working independently in Japan (1924) and Austria (1927) devise the "Rhythm Method" of birth control after figuring out that women are fertile approximately midway through the average menstrual cycle.

1922 A.V. Hill and Otto Meyerhof receive the Nobel Prize for their research on skeletal muscle, especially that related to the generation of heat and the relationship between oxygen consumption and lactate production. This work leads to a better understanding of the energy used to sustain muscular contraction. Hill coins the term "oxygen debt."

1920-30 Researchers isolate and purify testosterone, the primary male hormone.

1936 Hans Selye introduces the concept of stress, and demonstrates that stress, for better or worse, is a constant influence in our daily lives. This research extends the early work of Walter Cannon, who demonstrated adrenal secretion of epinephrine in response to threatening circumstances. Together, these ideas give rise to the concept of "fight or flight."

1942 Russell Marker discovers a way to make synthetic progesterone with Mexican wild yams. His discovery makes progesterone production affordable and becomes the basis for hormonal oral contraceptive birth control pills.

1940-50 Hans Krebs and colleagues elucidate complex chemical processes that provide all living organisms with cellular energy through the Krebs cycle. They are awarded the Nobel Prize in 1953.

1948 Phillip Hench and colleagues report the anti-inflammatory actions of the hormone, cortisone, in the treatment of rheumatoid arthritis. At the time, cortisone was considered a miracle drug.

1950s Solomon Berson and Rosalyn Yalow develop the radioimmunoassay that allows detection of minute concentrations of biological or pharmacological substances in blood and other fluids. This methodology, for which Yalow is awarded the 1977 Nobel Prize, revolutionizes endocrinology because it is a rapid and simple way to quantify the concentration of many different peptide hormones.

1960-70 Alfred Gilman and Martin Rodbell perform seminal studies elucidating the general mechanism of message transduction from the exterior of the cell to its interior. They discover that G-proteins play a crucial role in relaying sensory and hormonal messages to the cells. This finding leads researchers toward an improved understanding of widespread diseases like cholera and diabetes, and wins them the Nobel Prize in 1994.

1970 Pierre Changeux isolates the acetylcholine receptor. It is the first receptor to be identified.

1970s Roger Guillemin and Andrew Schally isolate and purify a wide array of peptide hormones (releasing factors) from a part of the brain called the hypothalamus that control hormone-producing glands, including Thyroid Releasing Factor (TRF) and Thyroid Stimulating Hormone (TSH). They win the 1977 Nobel Prize for this discovery and open new avenues of research into how the brain and hormones work.

1960-70 Sune Bergstrom, Bengt Samuelsson and John Vane characterize the structure of prostaglandins. Further, they find that these compounds cause inflammation and that their production can be inhibited by non-steroidal anti-inflammatory drugs, such as aspirin. They are awarded the Nobel Prize in 1982.

1973 Solomon Snyder and colleagues demonstrate that human brains contain receptors to opiates such as heroin and morphine, explaining the pharmacological properties of these drugs. This leads Snyder and others to seek the body's own opiates, called enkephalins and endorphins, that form the basis of the runners high.

1995 Jeffrey Friedman discovers the hormone leptin (from the Greek word leptos, meaning thin) which has important effects in regulating body weight, metabolism and reproductive function. Leptin, the first member of a new class of mediators called adipokines, is expressed predominantly by adipocytes and supports the idea that body weight is a measure of total fat mass.

1820 Jean-Francois Coindet first uses iodine in the treatment of enlarged thyroid gland (goiter) ultimately leading to the commercialization of iodized salt.

1855 Thomas Addison recognizes adrenocortical insufficiency (Addison's disease) a condition in which the adrenal glands do not produce enough cortisol. This represents the first correlation of a collection of symptoms with pathological changes in an endocrine gland.

1901 John Abel and Jokichi Takamine isolate and purify a substance from the adrenal gland that has profound effects on blood pressure. It is referred to as epinephrine in the U.S. and adrenaline in the U.K.

1906 Sir Frederick Gowland Hopkins discovers certain food factors are important to health and well-being. In 1912, Cashmir Funk named the special nutritional parts of food a "vitamine" (later shortened to "vitamin") after "vita" meaning life and "amine" from compounds found in the thiamine he isolated from rice husks. Hopkins and Funk formulate the vitamin hypothesis of deficiency disease, stating that a lack of vitamins can cause sickness.

1917 George Papanicolau discovers the estrous cycle in guinea pigs and introduces the vaginal smear test, later known as the Pap Test, used for detecting cervical cancer.

1919 Harvey Cushing and colleagues provide evidence for a link between the anterior pituitary gland and reproductive organs.

1921 Frederick Banting, Charles Best and John Macleod discover the hormone, insulin, leading to the first effective treatment for diabetes. Banting and Macleod win the 1923 Nobel Prize for their research and share their award with colleagues Best and James Collipp.

1928 Selmar Aschheim and Bernhardt Zondek develop the urine pregnancy test, forerunner of the modern home pregnancy test.

1931 L. Haberlandt demonstrates that pregnancy can be prevented by injection of pregnancy hormones. This discovery culminates in the development of modern birth control pills. The discovery is largely ignored until the 1950s when Gregory Pincus develops the contraceptive pill.

1931 Otto Warburg receives the Nobel Prize for discovering the mechanism of cell oxidation and identifying the iron-enzyme cytochrome complex, which catalyzes this process. Warburg wins another Nobel in 1944 for his cancer-related research, but was not permitted to accept the award by Hitler.

1937 Albert Szent-Gyorgyi receives the Nobel Prize for his work on Vitamin C, demonstrating its antioxidant properties. Antioxidants delay or prevent damage to cellular macromolecules (such as DNA) caused by exposure to free radicals.

1940s Carl and Gerty Cori, a husband and wife team who collaborated much of their lives, study the fate of glucose and define how it is converted to lactate under conditions such as intense exercise to yield energy. They win the 1947 Nobel Prize for their work.

1945 Cho Li and Herbert Evans isolate growth hormone which is responsible for normal growth and development. Evans also invents Evans Blue dye, used for measuring blood volume.

1949 Leon Velluz and Gaston Amiard discover Vitamin D – the sunshine vitamin.

1953 Vincent duVigneaud and colleagues synthesize the first peptide hormone, oxytocin, for which he is awarded the Nobel Prize in Chemistry in 1955. Oxytocin is important for stimulation of milk secretion from the mammary gland and uterine contraction during birth. The synthetic form of oxytocin, known as "pitocin," is used today in clinical medicine to increase uterine contractions and speed the birthing process. DuVigneaud is considered by many to be the father of modern peptide research.

1968 Stanley Dudrick perfects a technique for successful long-term delivery of total intravenous nutrient solution leading to current day nutritional support of critically ill patients.

1970s Michael Brown and Joseph Goldstein perform studies on the regulation of cholesterol metabolism that contribute to development of lifesaving cholesterol-lowering statin drugs and treatment of atherosclerosis (hardening of the arteries). They win a 1985 Nobel Prize for their research.

1971 Earl Sutherland wins a Nobel Prize for identifying cyclic AMP, a chemical, or second messenger, that mobilizes blood sugar in response to adrenaline so that the host can respond to stress. This is the first discovery of a signaling system inside the cell. cAMP turns out to be a missing link in a long series of biological control mechanisms. This discovery leads to understanding of a broad range of hormones, neurotransmitters and pharmaceutical agents.

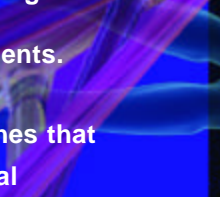
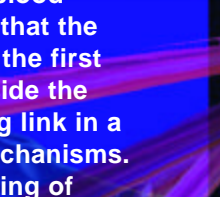
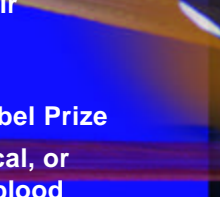
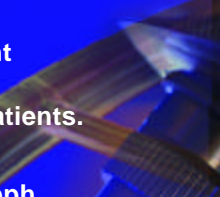
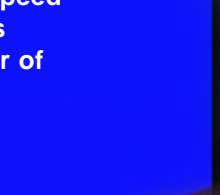
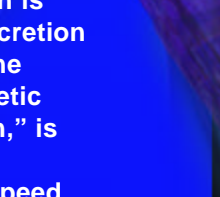
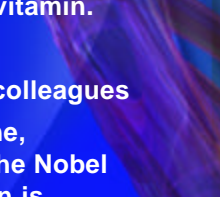
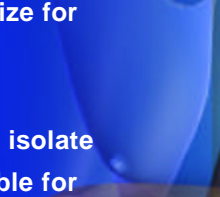
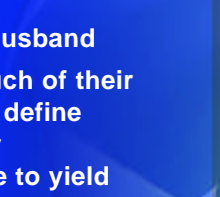
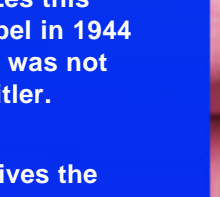
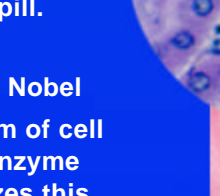
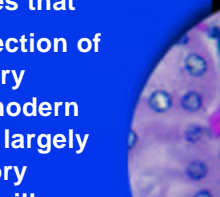
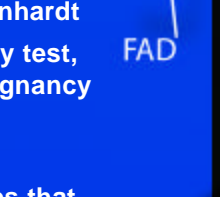
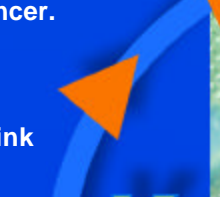
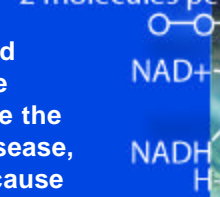
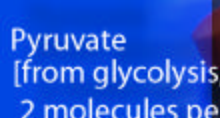
1981 Adolfo J. de Bold establishes that the heart produces a hormone (atrial natriuretic factor) that helps regulate blood pressure and kidney function, and paves the way for the development of new antihypertension and diuretic drugs.

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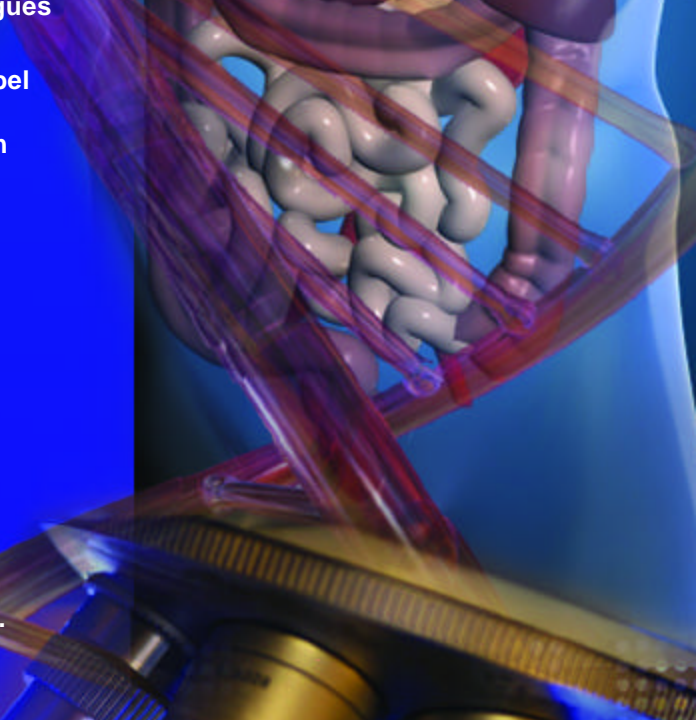
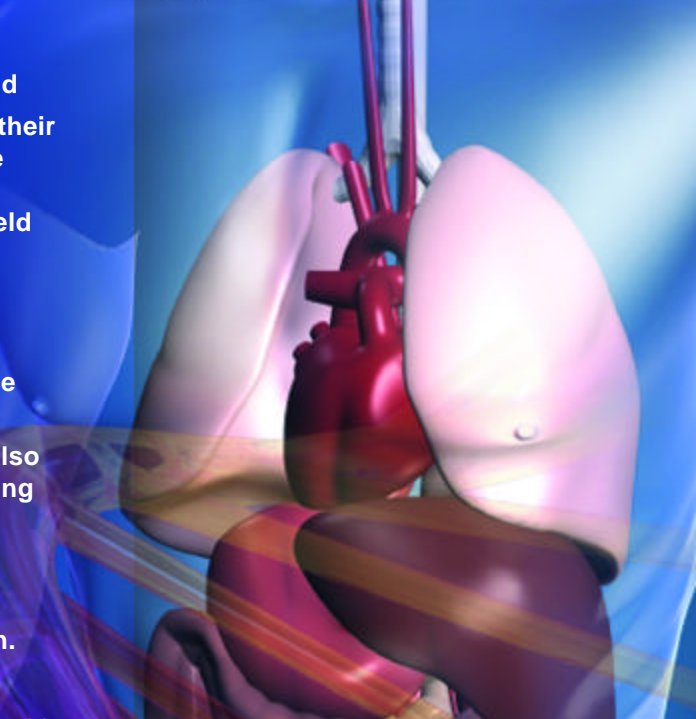
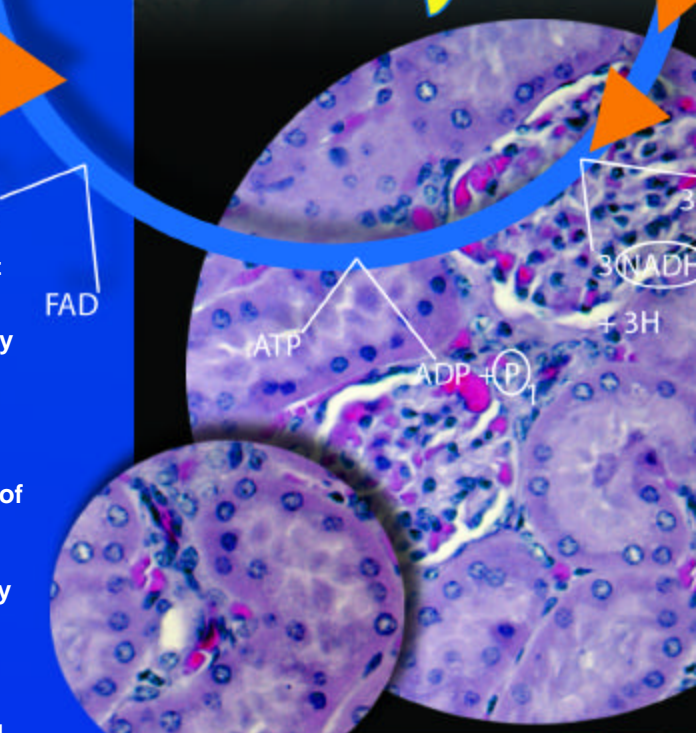
THE INFLUENCE OF BORAX AND BORIC ACID UPON NUTRITION WITH SPECIAL REFERENCE TO PROTEID METABOLISM.

BY R. H. CHITTENDEN AND WILLIAM J. GIES.

[From the Sheffield Laboratory of Physiological Chemistry, Yale University]



Krebs Cycle



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