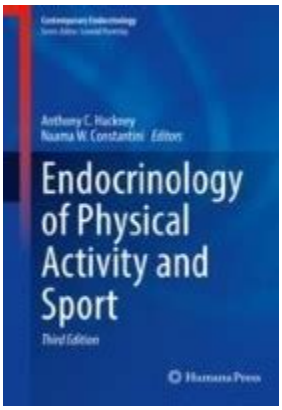
The major differences between catabolism and anabolism are summarized below. Catabolism breaks down big complex molecules into smaller, easier to absorb molecules. Anabolism builds molecules required for the body's functionality. The process of catabolism releases energy. Anabolic processes require energy.

Anabolic-androgenic steroids: How do they work and what are the risks?

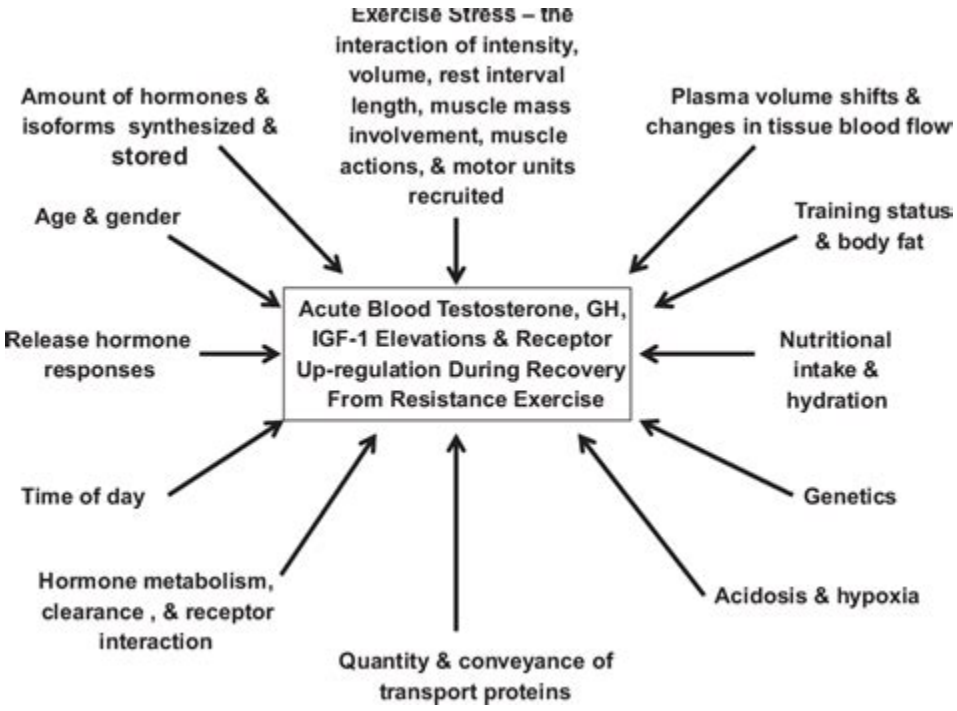
Anabolism Definition Anabolism collectively refers to all the processes of chemical reactions that build larger molecules out of smaller molecules or atoms; these processes are also known as anabolic processes or anabolic pathways. The opposite of anabolism is catabolism, the set of processes that breaks down larger molecules into smaller ones.

The Role of Hormones in Exercise-Induced Muscle Hypertrophy



Anabolic-androgenic steroids (AAS) are a class of natural and synthetic hormones that owe their name to their chemical structure (the steroid nucleus, see Figure 1) and the biological effects (anabolic and androgenic) they induce.

Recovery responses of testosterone, growth hormone, and IGF-1 after .



Cortisol. Glucagon. Cytokines. The anabolic hormones are responsible for growth and tissue repair. They include: Estrogen. Testosterone. Insulin. Human growth hormone. Can I control my metabolism?

Human metabolism: pathways and clinical aspects - ScienceDirect

Human metabolism: pathways and clinical aspects

Rhys D Evans
Lisa C Heather

Abstract

Metabolism describes the series of chemical reactions that are concerned with the provision of energy to biological systems. They may be divided into reactions involved in energy yield (catabolism: demand exceeds supply), and energy storage (anabolism: supply exceeds demand). Regulation of these pathways is critical for homeostasis, and derangements in metabolism are seen in a wide variety of pathological processes. Understanding metabolism is key to the treatment of many diseases, notably diabetes, as well as underpinning clinical nutritional support.

Keywords Carbohydrates; diabetes; lipids; metabolism; proteins

The word metabolism is derived from the Greek 'to change', and describes the series of biochemical reactions that provide the body with the energy it requires to maintain biological functions (e.g. biosynthesis, maintenance of ionic gradients, muscle contraction, heat generation). This energy must ultimately be derived from food. The rate of energy production measured under basal conditions – 'basal metabolic rate' (BMR) – is affected by many factors, including muscle contraction, food ingestion, size, gender, age, temperature, sepsis, cancer and several hormones, including thyroid hormones and catecholamines. The metabolic rate can be estimated by measuring oxygen consumption (VO_2; indirect calorimetry).

The process of converting excess energy-rich substrate precursors in food into complex energy storage molecules is termed anabolism, whereas the process degrading substrates to mobilize biologically useable energy is termed catabolism. Imbalance of these pathways leads to cachexia or obesity. Tissues have specialized metabolic functions (e.g. adipose tissue stores substrate, muscle oxidizes substrate, lactating mammary gland exports substrate). The liver is a metabolic 'transformer' that regulates substrate supply between tissues, and pancreas detects and signals nutritional status.

Metabolic energy is carried in two main forms: (i) 'high energy' phosphate groups including ATP, GTP and creatine phosphate; and (ii) hydride ion (effectively, electron) carriers such as NADH, $FADH_2$ and NADPH. These molecules are used in chemical reactions throughout the cell that would not occur without external energy input, because they are energetically unfavourable. Besides carrying energy in metabolic pathways, the cellular energy charge and redox potential are major regulators of metabolism.

Rhys D Evans *is Reader in Metabolic Biochemistry, Department of Physiology, Anatomy, and Genetics, University of Oxford, Oxford, UK. Conflicts of interest: none declared.*

Lisa C Heather *is Associate Professor in Metabolic Biochemistry, Department of Physiology, Anatomy, and Genetics, University of Oxford, Oxford, UK. Conflicts of interest: none declared.*

Energy substrates

Energy is derived from three groups of energy-rich compounds: carbohydrates, lipid (fats) and proteins (amino acids) (Figure 1). Carbohydrates (hydrated carbon: $C(H_2O)_n$) are soluble, fast and easy to transport, relatively non-toxic, and can yield some energy anaerobically in hypoxia or ischaemia when oxygen availability is limited. However, their water solubility means that in storage form as glycogen they retain significant amounts of water; in addition, carbohydrates are partially oxidized and hence do not contain as much energy as lipids. Therefore only limited amounts are stored. By contrast, lipids are highly reduced and very energy-dense, hence they function as the principal energy store for free-living animals and are major energy providers to most tissues. However, their water-insolubility makes lipids slow to mobilize, and unlike carbohydrates they cannot yield energy anaerobically, so cannot be used by erythrocytes and renal medulla. Furthermore, they cannot cross the blood–brain barrier so cannot be used by the CNS. Because lipids are more reduced, relatively more oxygen is required to extract energy from them (2.8 ATP/O_2) compared to carbohydrates (3.7 ATP/O_2) and this may be critical in high work-load/oxygen-challenged tissues such as myocardium and exercising skeletal muscle. Also, lipids in the form of non-esterified fatty acids are amphipathic (detergent-like) and hence disruptive to membranes and potentially toxic. Amino acids have similar energy yields to carbohydrates, and most can be converted to glucose. Under conditions of carbohydrate depletion (e.g. starvation) certain proteins can be broken down to yield amino acids for conversion into carbohydrates to supply glucose-dependent tissues. Although proteins are not stored specifically to supply energy, they act as a virtual carbohydrate supply in catabolic states of carbohydrate exhaustion (e.g. starvation).

Metabolism of the three major substrate groups converges at a common intermediate, acetyl-CoA, in mitochondria (Figure 1). Acetyl-CoA can enter the tricarboxylic acid (TCA; Krebs) cycle and be completely oxidized to 3 NADH, 1 $FADH_2$, 1 GTP and 2 CO_2. The hydride carriers convey electrons to the electron transport chain in the presence of oxygen, and result in the generation of large amounts of ATP via oxidative phosphorylation (and H_2O).

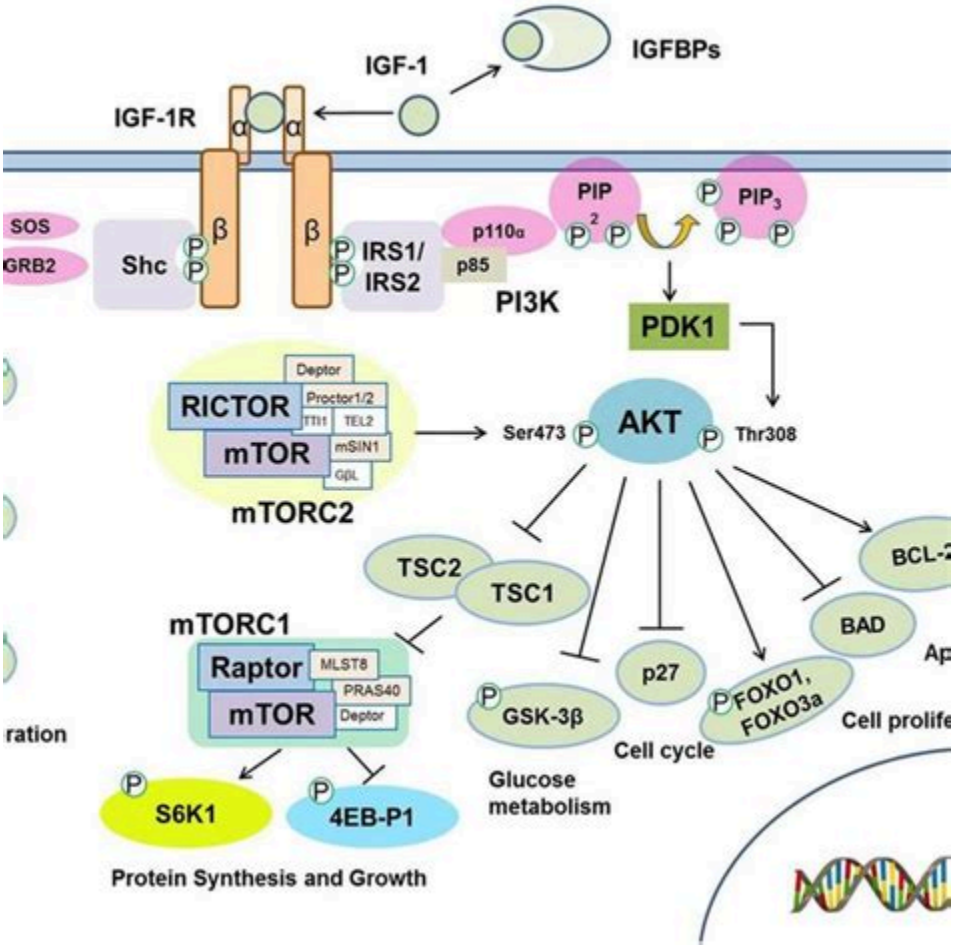
Pancreas is the key organ detecting metabolic status. Pancreatic β-cells sense high blood glucose and release insulin in response. Pancreatic α-cells release glucagon in response to low blood glucose concentration. Carbohydrate and lipid utilization are reciprocally related (Randle cycle), a mechanism partly orchestrated by insulin.

Carbohydrate metabolism

Carbohydrate metabolism centres around the hexose sugar glucose ($C_6H_{12}O_6$). Following uptake into the cell by glucose transporters (GLUT), glucose is rapidly phosphorylated to glucose-6-phosphate (*G6P*) by the enzyme hexokinase (liver and

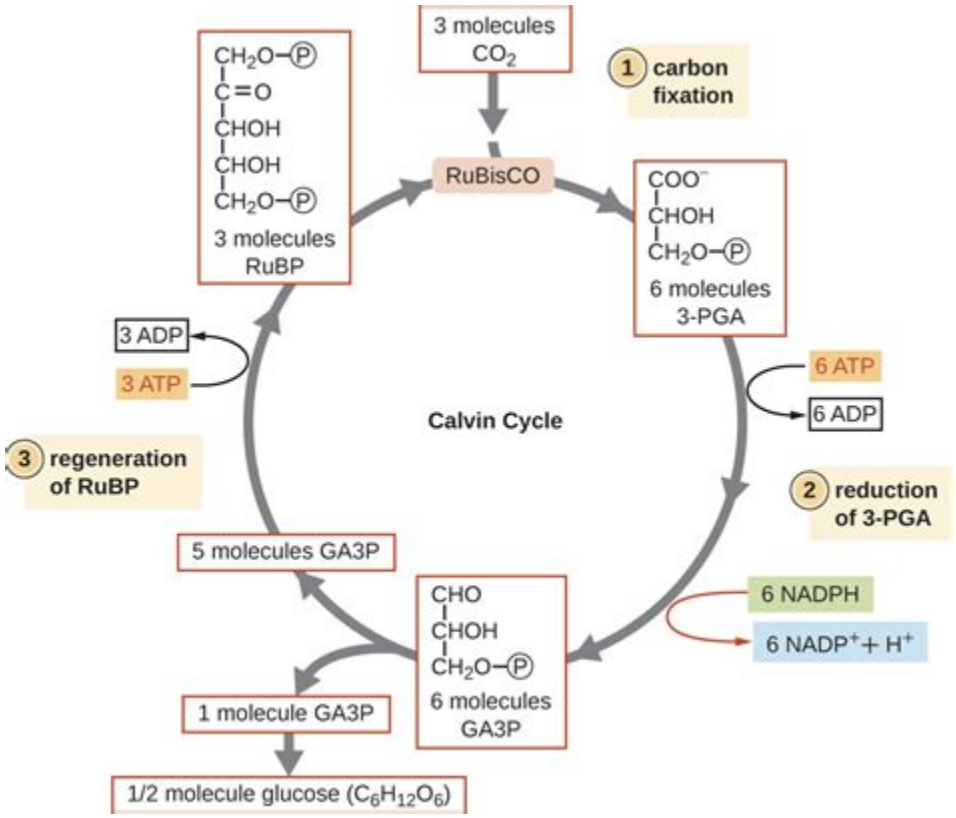
There are three major classifications of hormones: steroid, peptide and amines (modified amino acid hormones). Each class of hormones has a unique chemical structure that determines how it interacts with specific receptors. . Human growth hormone (HGH) is an anabolic peptide hormone secreted by the anterior pituitary gland that stimulates .

Growth Hormone(s), Testosterone, Insulin-Like Growth Factors, and .



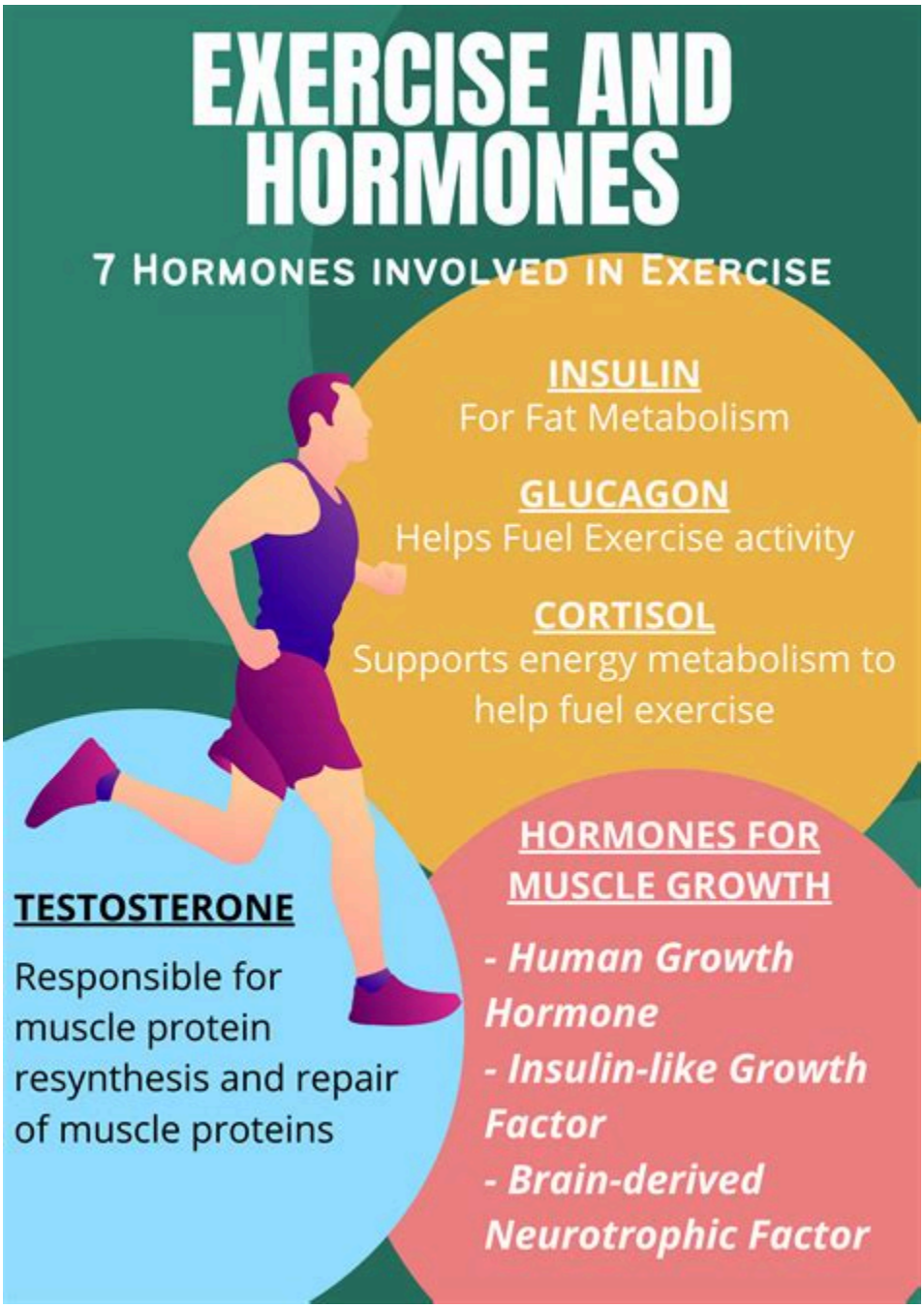
Testosterone is one of the most potent naturally secreted androgenic-anabolic hormones, and its biological effects include promotion of muscle growth. In muscle, testosterone stimulates protein synthesis (anabolic effect) and inhibits protein degradation (anti-catabolic effect); combined, these effects account for the promotion of muscle .

10. 2: Overview of Metabolic Reactions - Biology LibreTexts



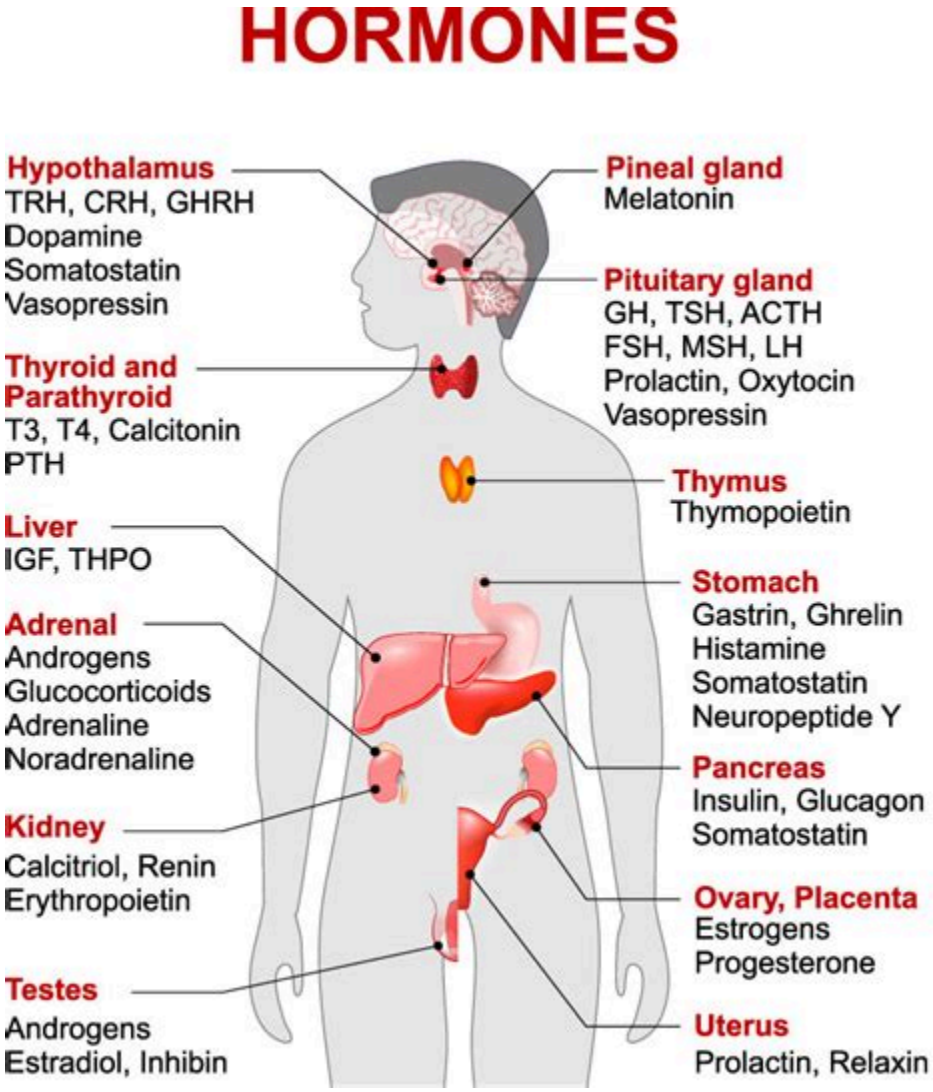
There are 4 major anabolic hormones that indirectly or directly affect wound healing. They are human growth hormone (HGH), insulin-like growth factor-1 (IGF-1), insulin, and testosterone (and its analogs) (Table (Table2). 2). As will be described later, each hormone has a specific mode of action but there are considerable interrelationships .

Exercise and Hormones: 8 Hormones Involved in Exercise - ACE



Sympathetic activation and several hormones, including catecholamines, cortisol and growth hormone, stimulate hepatic glycogenolysis and gluconeogenesis, with glucose release into the blood, but glucagon is the major catabolic signal, raising blood glucose by stimulating hepatic glucose production and inhibiting the reciprocal anabolic pathways.

8. 2: Types of Hormones - Biology LibreTexts



hyperthyroidism: the excessive production of hormones by the thyroid. This page titled 37. 8: Regulation of Body Processes - Hormonal Regulation of Metabolism is shared under a CC BY-SA 4. 0 license and was authored, remixed, and/or curated by Boundless. The levels of glucose in the blood are regulated by the hormones insulin and glucagon from .

The Role of Anabolic Hormones for Wound Healing in Catabolic States

JOURNAL OF BURNS AND WOUNDS WWW.JOURNALOFBURNSANDWOUNDS.COM

The Role of Anabolic Hormones for Wound Healing in Catabolic States

Robert H. Demling, MD

Burn Center, Brigham & Women's Hospital, Boston, MA, and Harvard Medical School, Boston, MA

Correspondence: rhdemling@partners.org

Objective: The purpose of this paper is to present an overview of the interrelationship between hormones, nutrition, and wound healing. **Methods:** The data on various hormones and their effects on specific elements of nutrition and wound healing are reviewed. **Results:** The key anabolic hormones are human growth hormone, insulin-like growth factor-1, insulin, and testosterone and its analogs. Although each has specific metabolic actions, there is also a very important hormone-hormone interaction. A deficiency of these hormones occurs in acute and chronic catabolic states, resulting in lean mass loss and impairing the healing process. **Conclusion:** There is a well-recognized interrelationship between hormones, nutrition, and wound healing. The anabolic process of protein synthesis, with new tissue formation, requires the action of anabolic hormones. Exogenous administration of these agents has been shown to maintain or increase lean body mass as well as directly stimulate the healing process through their anabolic and anticatabolic actions.

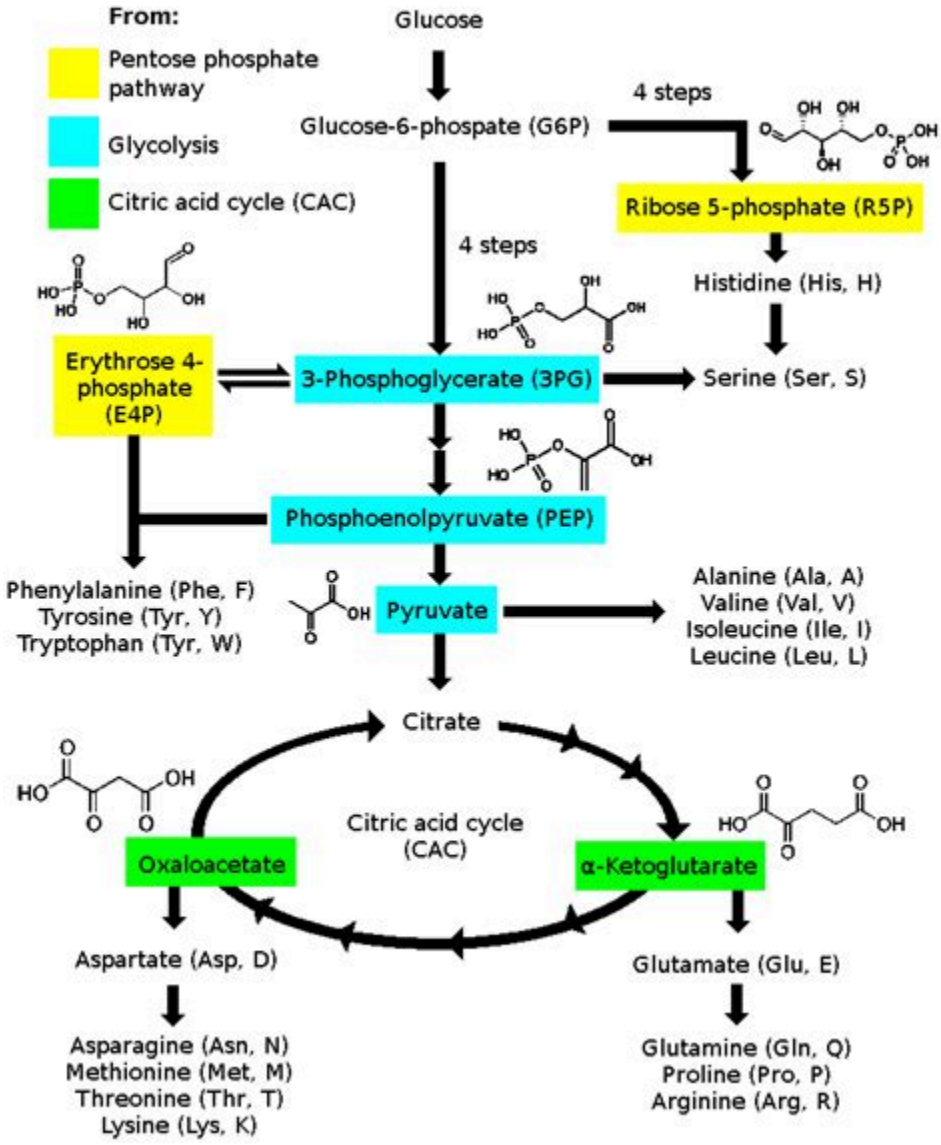
There are a number of key hormones involved with energy production, anabolism or protein synthesis, and catabolism or protein breakdown. The balance of anabolic and catabolic hormones affects wound healing both indirectly by the status of overall net protein synthesis and directly by improving the wound healing process.[1-4] A decrease in normal anabolic hormone activity and an increase in catabolic hormone activity occurs with the "stress response" to injury and also with aging and chronic illness.

The altered hormonal environment can lead to both a significant increase in catabolism, with net tissue breakdown, and a decrease in the overall anabolic activity required to preserve lean mass and maintain the healing process. The stress response to injury also produces an alteration in the normally protective protein sparing as seen in the normal and starved states aimed at preserving lean body mass.

The metabolic pathways, which generate energy to meet daily demands and for new protein synthesis, are very tightly regulated in normal or starved humans.[5-8] Macronutrients in the form of fat and carbohydrates are channeled into production of energy,[5-11] while the majority of protein consumed is used for protein synthesis, restoring and maintaining lean body mass. Lean mass, the metabolically active body compartment containing all the protein plus water, in the body includes muscle, skin, and the immune system, all of which are

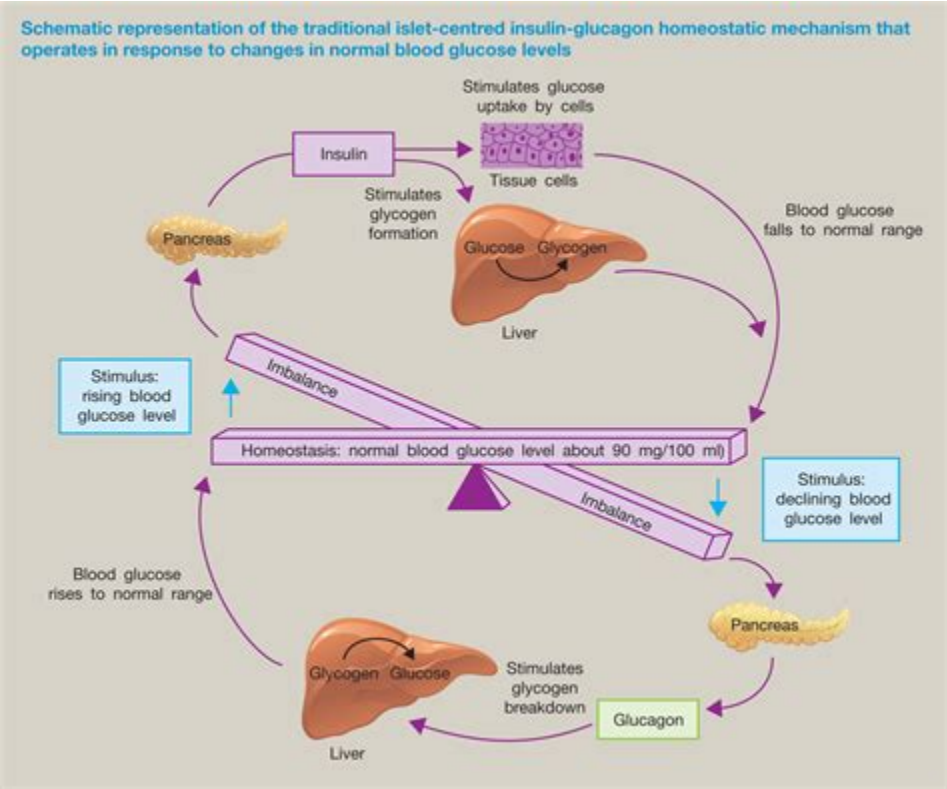
The classic anabolic hormones are the anabolic steroids, which stimulate protein synthesis and muscle growth, and insulin . Photosynthetic carbohydrate synthesis Photosynthetic carbohydrate synthesis in plants and certain bacteria is an anabolic process that produces glucose, cellulose, starch, lipids, and proteins from CO 2. [6]

Anabolism - Wikipedia



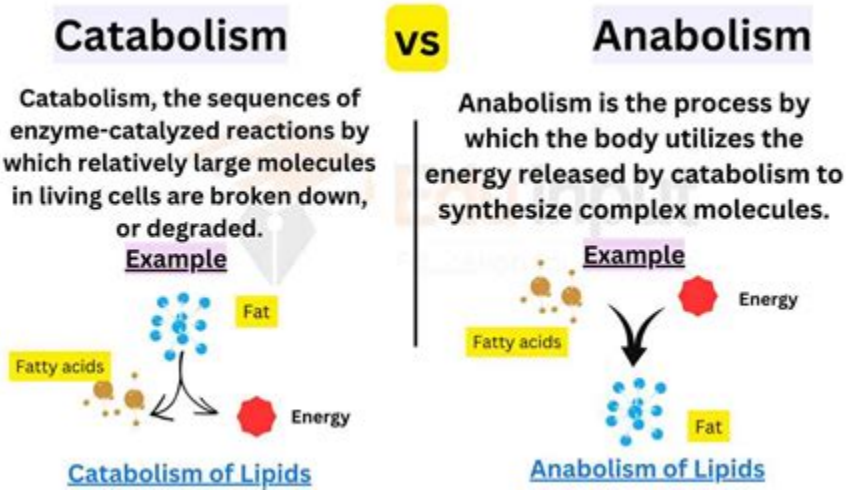
The purpose of this review is to examine the role of resistance exercise (RE) on the recovery responses of three major anabolic hormones, testosterone, growth hormone (s), and insulin-like growth factor 1. Each hormone has a complexity related to differential pathways of action as well as interactions with binding proteins and receptor .

Carbohydrate Metabolism : Hormone Regulation of Metabolism



The complexity and redundancy of the endocrine pathways during recovery related to anabolic function in the body belie an oversimplistic approach to its study. The purpose of this review is to examine the role of resistance exercise (RE) on the recovery responses of three major anabolic hormones, testosterone, growth hormone(s), and insulin-like growth factor 1. Each hormone has a complexity .

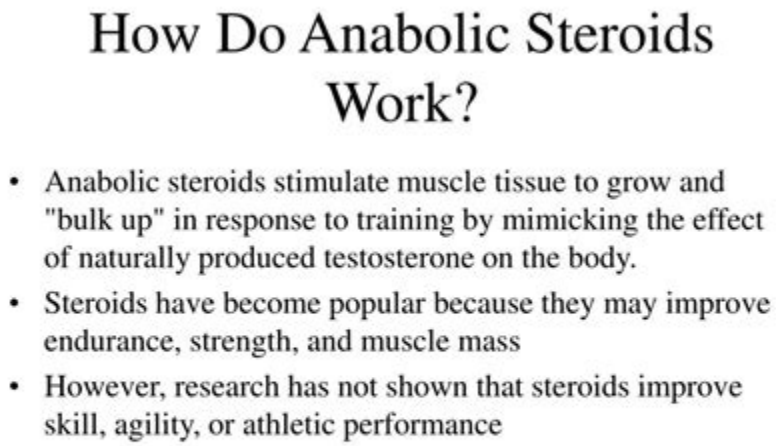
Anabolism - Definition & Examples of Anabolic Pathways | Biology



On the other hand, chronic supraphysiological levels of anabolic hormones seen in amateur and professional athletes using androgenic anabolic steroids . However, resistance training-induced acute

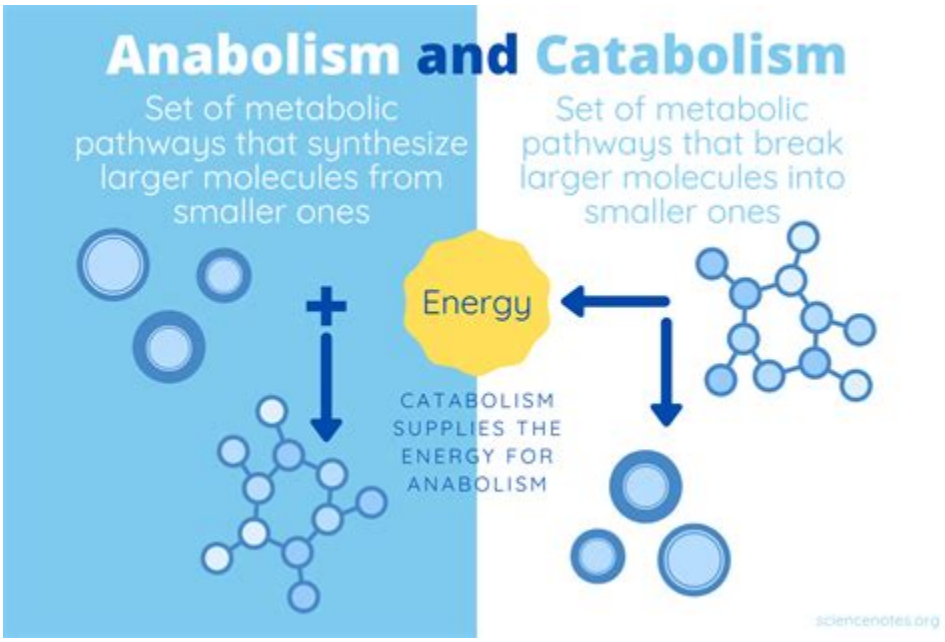
physiological hormonal increases might not trigger major anabolic responses, but rather allow other anabolic mechanisms to function properly and .

Anabolic Steroid Use Disorder - StatPearls - NCBI Bookshelf



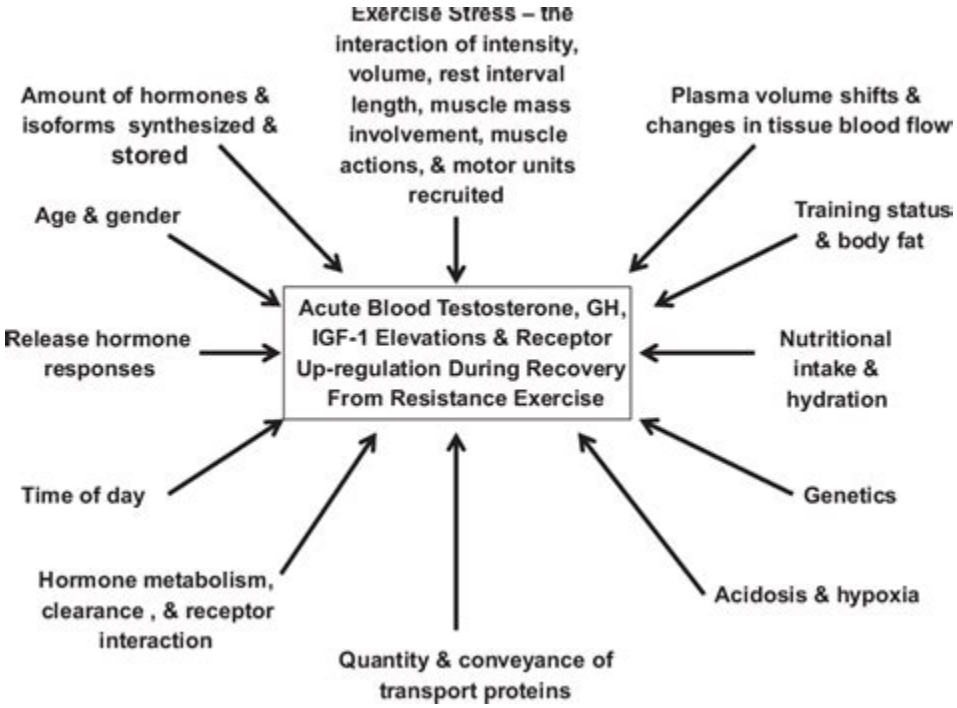
Amino Acid-Derived Hormones. The amino acid-derived hormones are relatively small molecules that are derived from the amino acids tyrosine and tryptophan, shown in Figure \(\PageIndex{2}\). If a hormone is amino acid-derived, its chemical name will end in "-ine". Examples of amino acid-derived hormones include epinephrine and norepinephrine, which are synthesized in the medulla of the .

Anabolism and Catabolism Definition and Examples - ThoughtCo



Although the specific hormonal influence must be considered within the context of the entire endocrine system and its relationship with other physiological systems, three key hormones are considered the "anabolic giants" in cellular growth and repair: testosterone, the growth hormone superfamily, and the insulin-like growth factor (IGF) superfam.

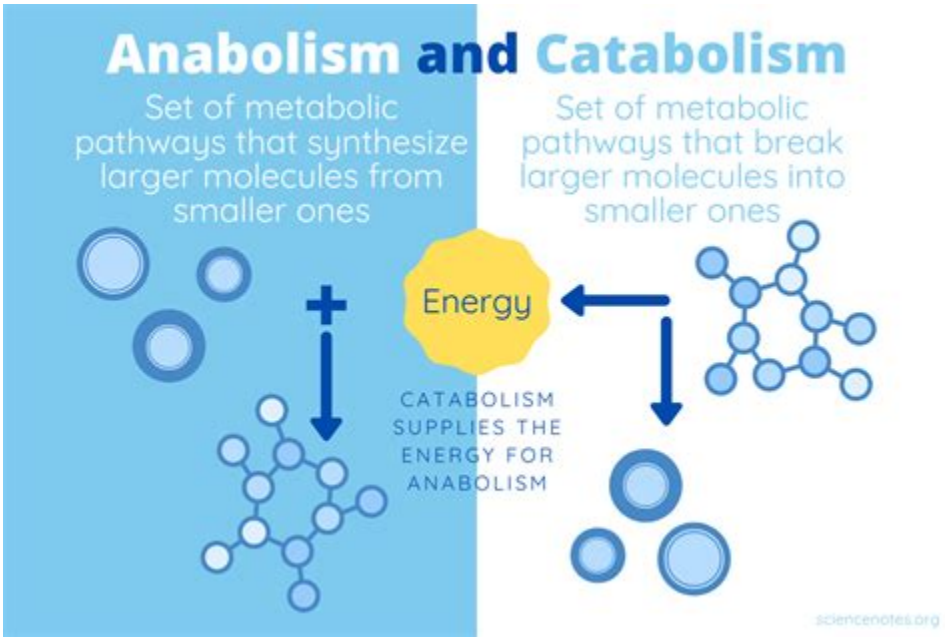
Recovery responses of testosterone, growth hormone, and IGF-1 after .



Insulin is also the major anabolic hormone of the body; it increases amino acid uptake into tissues,

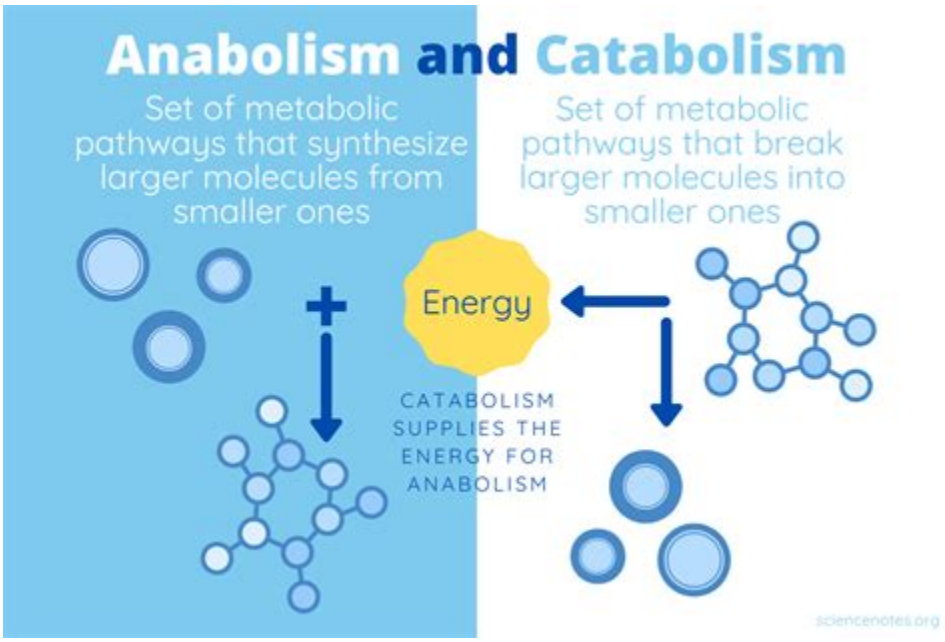
protein synthesis, and cell growth, as well as fuel storage. The blood concentration of insulin declines approximately 120 minutes after a meal as blood glucose concentration declines due to glucose uptake and use by tissues. The blood .

Catabolism vs. Anabolism: What's the Difference?



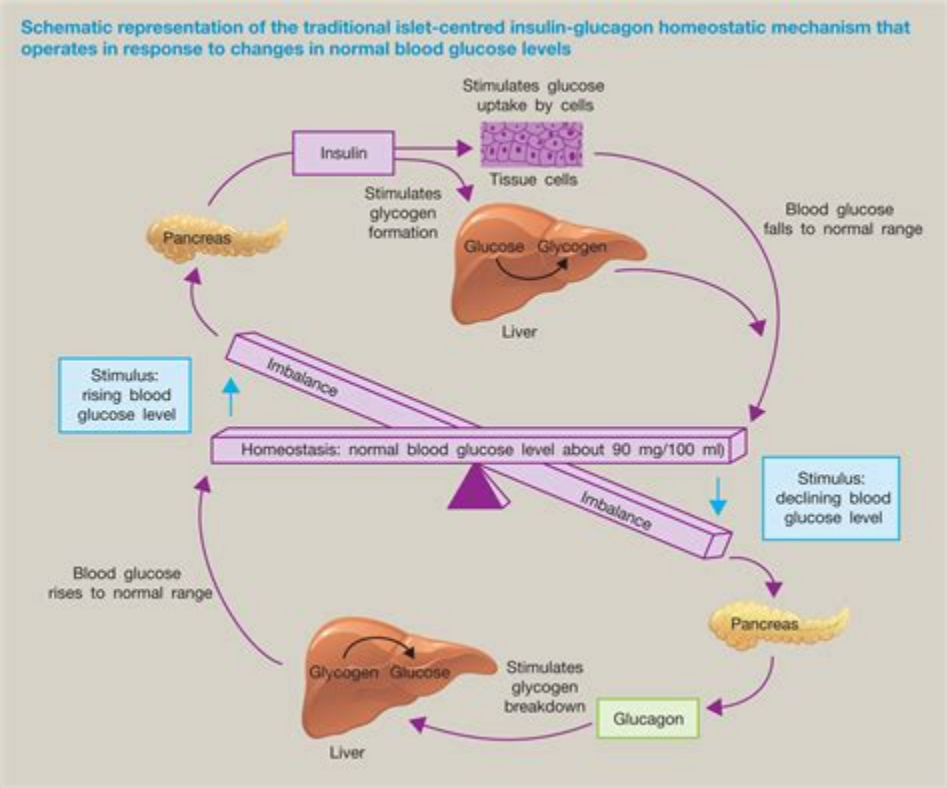
Insulin is one of the most potent anabolic hormones in the human body and acts to induce protein anabolism in the entire body when amino acids are replenished. . GH may be viewed as the primary anabolic hormone during stress and fasting, whereas insulin is the major anabolic hormone in the preprandial timeframe.

Difference Between Anabolism and Catabolism - An Overview - BYJU'S



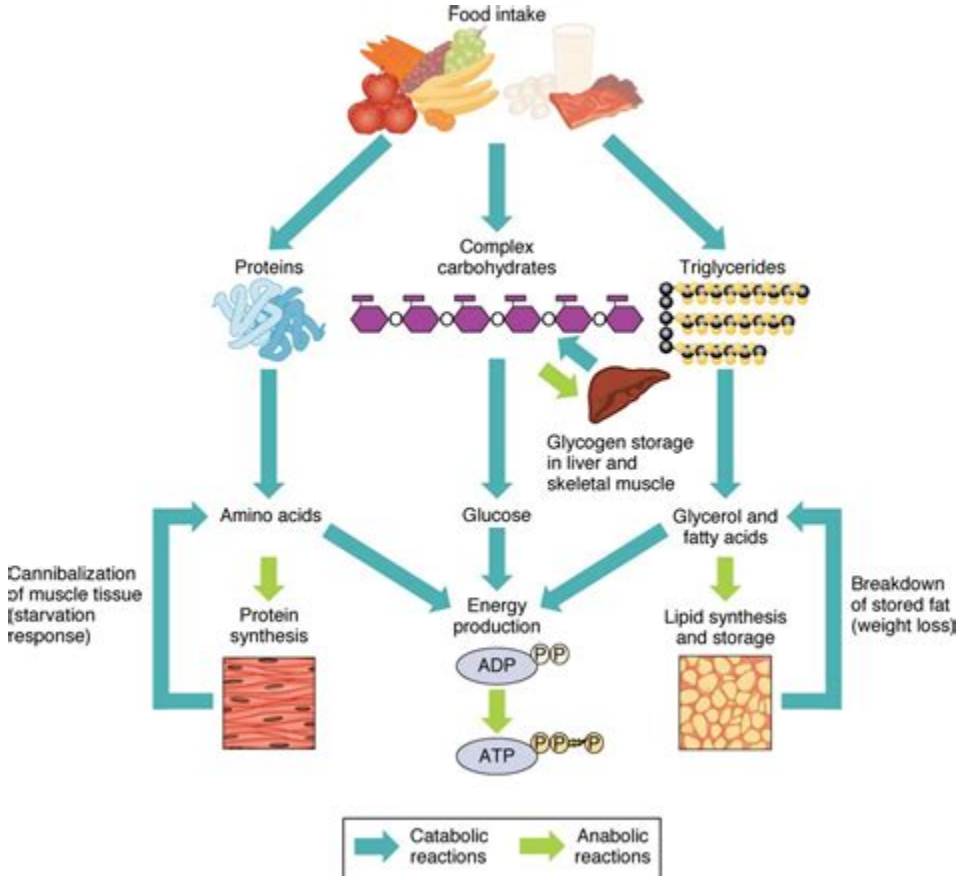
The term "anabolic" means the use of body energy to promote growth and regulate constructive metabolism. Anabolic-androgenic steroids (AAS) are steroidal androgens, which include natural androgens such as male sex hormone testosterone or could be synthetic to mimic the action of the endogenous male hormone. Androgen use has become a major public health concern due to the transition of the use .

Hormonal Regulation of Metabolism - Biology LibreTexts



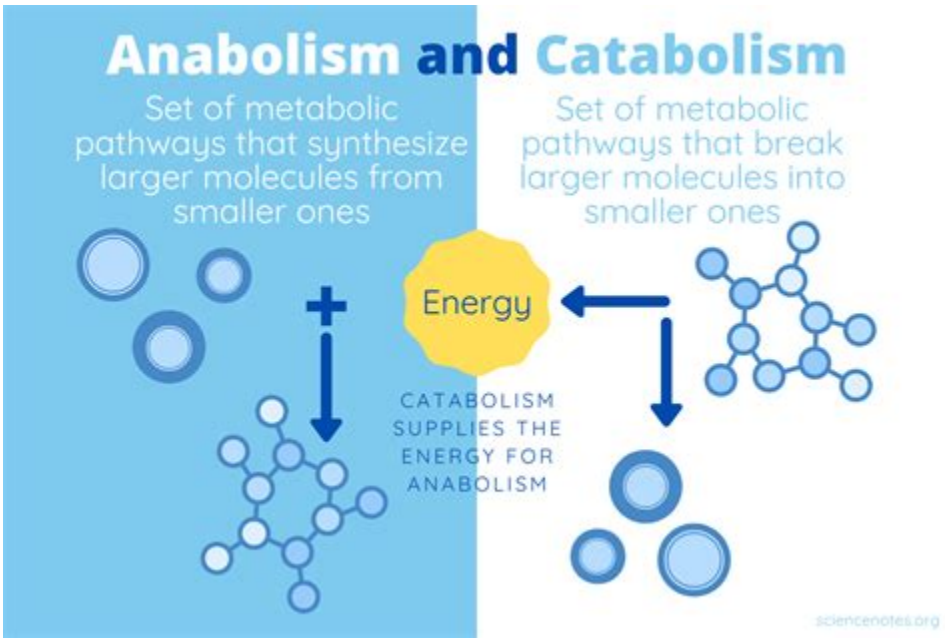
Catabolic and anabolic hormones in the body help regulate metabolic processes. Catabolic hormones stimulate the breakdown of molecules and the production of energy. These include cortisol, glucagon, adrenaline/epinephrine, and cytokines. All of these hormones are mobilized at specific times to meet the needs of the body.

24. 1 Overview of Metabolic Reactions - Anatomy & Physiology



Anabolism and catabolism are the two broad classes of biochemical reactions that make up metabolism. Anabolism is the synthesis of complex molecules from simpler ones. These chemical reactions require energy. Catabolism is the breakdown of complex molecules into simpler ones. These reactions release energy.

Complete Guide To Protein Anabolism and Catabolism



Anabolic reactions, also called biosynthesis reactions, create new molecules that form new cells and tissues, and revitalize organs. Hormonal Regulation of Metabolism. Catabolic and anabolic hormones in the body help regulate metabolic processes. Catabolic hormones stimulate the breakdown of molecules and the production of energy. These include .

Testosterone physiology in resistance exercise and training: the up .

In fact, during exercise or anabolic hormonal stimulation, muscles grow because new proteins and organelles accumulate in the cytosol increasing cellular volume, a process named hypertrophy.

- https://telegra.ph/Nebido-De-Buyer-02-09
- https://www.southparkstudios.com/forum/viewtopic.php?f=2&t=227745
- https://groups.google.com/g/55sports20/c/fEjC5BkaIpk