Peptide Hormones, Growth and Related Substances

What are they?
The category of peptide hormones, growth factors and related substances includes substances having a variety of structures and effects. These proteins, produced by the body itself for the most part, act as chemical messengers to stimulate the production of other substances. Some of these can be produced artificially, to mimic what we produce naturally, and abused to enhance performance.

Status on the prohibited list
These come under S2 on the list of substances and methods prohibited at all times (In and Out of Competition).

Included in this class:
EPO, hGH, Gonadotrophins, Insulin and Corticotrophins.

Why athletes might use them
Erythropoietin (EPO)-Erythropoietin is responsible for producing and maintaining levels of red blood cells (erythrocytes). Once the body detects a decline in the supply of oxygen, EPO is synthesized in the kidney. This then stimulates the production of red blood cells in bone marrow. EPO may be used to perform better in endurance performances.

Human Growth Hormone (hGH)-
hGH has two main effects, acting directly as a chemical messenger, but also indirectly to stimulate the production of other hormones. The hormone regulates physical growth in adolescents and stimulates cell division. It also acts on the body to reduce fat deposits, raise blood sugar levels and support the build-up of muscle tissue. Athletes may use growth hormone to increase muscle size and strength.

Insulin Growth Factors (IGF-1)
Insulin plays a fundamental role in the functioning of the human body by transporting glucose, the body's main source of energy, from the blood to the muscles. A higher level of insulin is released in response to the ingestion of food in order to assist in cell absorption of glucose and amino acids. Insulin increases the synthesis of glycogen in the liver, stimulates the production of fats from glucose and inhibits the conversion of proteins to glucose.

Insulin triggers a number of anabolic (building up) processes in metabolism, including synthesis of glycogen, lipids and proteins. Originally used mainly in strength sports, insulin has in the meantime come to be used in endurance sports also. Insulin and carbohydrates are combined in specific preparation for competition to store larger amounts of energy in muscle cells.

Human Chorionic Gonadotrophin (hCG)
Human chorionic gonadotrophin (hCG) is a glycoprotein hormone which is produced in large amounts during pregnancy and also by certain types of tumour. Some male athletes use pharmaceutical preparations of hCG to stimulate testosterone production before competition and/or to prevent testicular shutdown and atrophy during and after prolonged courses of androgen administration. This hormone increases production of endogenous steroids and may be used by athletes as it increases muscle size and strength when the athlete
is in strength training while also acting as a masking agent. HCG use in females would have no beneficial effect at all in sport.

**Corticotrophins - Adreno Cortico Trophin Hormone (ACTH)**

Adrenocorticotropic hormone is a polypeptide hormone produced by the pituitary gland. ACTH is used by athletes in order to increase the amount of androgens secreted by the adrenal glands as these are converted to testosterone.

Potential harmful side-effects

**EPO**-
- Increased viscosity, 'thickness', of the blood
- High blood pressure (hypertension)
- Myocardial infarction
- Cerebral infarction
- Blood clots in the lungs (pulmonary embolism)
- Convulsions
- The Italian anti-doping expert Alessandro Donati estimates that up to 500,000 athletes’ worldwide use EPO.

**hGH**:
- Abnormal growth of hands, feet and face (acromegaly)
- Abnormal growth of internal organs, e.g. liver
- Joint disorders (arthropathies)
- Diabetes mellitus
- Cardiovascular diseases, e.g. high blood pressure (hypertension)

**IGF-1**
- Low blood sugar
- Abnormal growth of hands, feet and face (acromegaly)
- Headaches joint pains
- Musculoskeletal changes.

**hCG**:
- Breast development (in males) (gynaecomastia)
- Menstrual disorders (in women)

**Insulin**
- Low sugar level
- Shortness of breath
- Drowsiness
- Coma
- Brain damage

**ACTH**:
- Sleeping problems (insomnia)
- High blood pressure (hypertension)
- Diabetes mellitus
- Stomach ulcer
- Poor healing of wounds
- Loss of bone mass (osteoporosis)