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Growth hormone (HGH, Somatotropin) is a polypeptide hormone secreted by pituitary gland, which is located within the sella turcica ventral to the diaphragma sellae.

Pituitary gland comprises anatomically and functionally distinct anterior and posterior lobes. Blood supply of pituitary is derived from the superior and inferior hypophyseal arteries.

The endocrine environment of the fetus is unique with regard to the endocrine organs, the presence of certain hormones, changing and often high circulating concentrations of hormones, hormone metabolism and specialized response related to in-utero development. Although the pattern of fetal growth and development is not generally dependent on hormones with some important exceptions, the timing of these events is modulated by the level of endogenous hormones and exposure to hormone treatment. (Phillip L. Ballard, 1998).

The placenta also produces most, if not all of the releasing hormones synthesized by hypothalamus. Thus, the placenta
contributes to the circulating pool of pituitary and hypothalamic hormones in the fetus.

In general most endocrine systems of the fetus are functional by the end of the first trimester, although circulating levels of many hormones increase substantially only during the third trimester. In contrast the level of growth hormone increases during the first two-third of pregnancy and then declines towards term.

Cells that produce growth hormone, ACTH are detectable at 9th week of gestation. Hormone producing cells can differentiate and hormone synthesis in the absence of hypothalamic stimulation has been documented in embryonic pituitary in several in vivo studies.

During the second and third trimesters of pregnancy the variant form becomes the predominant form of growth hormone in maternal circulation and the pituitary form decreases. The proportion of growth hormone variants in circulation are similar to those in the pituitary except that the 20Kda form and the oligomeric forms are more prominent in the circulation, because of their slower metabolic clearance. (Michael O. Thorner et al).
Growth hormone is not the principle direct stimulator of growth, but it acts mainly by stimulating the formation of other hormones known as somatomedins or IGF1 and IGF2.

IGF1 or somatomedin -c, the more important factor for postnatal growth is produced in liver. IGF2 is much less affected by growth hormone and has a role in growth of fetus before birth. In contrast to other hormones, the IGFs’ do not arise from a single organ source but are secreted by most tissues in response to growth hormone stimulation and circulate in plasma bound to high affinity binding proteins. Animal studies suggest that liver is the greatest single source of total serum IGF activity.

There is an indirect evidence that the somatomedin group of peptides may be involved in human fetal development. For example, levels of somatomedins in cord plasma show a positive correlation with birth weight or length.

Levels of IGF1, IGF2 are low throughout gestation with only a small increase in IGF1 prior to 32 – 34 weeks. From then, until term there is two to fourfold rise in both peptides, although level at birth are lower than in normal adults. IGF1 level is low at birth and rises
gradually throughout childhood to reach adult level at 8 – 10 years age (I.K. Asthan, J. Zapf et al).

This lead to Daughaday’s original hypothesis that growth promoting effect of growth hormone were mediated by stimulation of liver to secrete the IGFs’ which in turn were carried peripherally to exert their effect on cartilage and extra skeletal cell proliferation. More recent evidence favours an autocrine role or a paracrine role rather than classic endocrine concept. IGF levels increase in extra-hepatic tissue in response to growth hormone stimulation, reaching a peak before maximum blood levels occur. IGF probably exerts its effect locally within these tissues before reaching the circulation, where it is complexed with binding proteins, which may restrict or modulate further activity, before clearance from the circulation.

There are two theories of growth hormone action. The growth hormone hypothesis and the somatomedin hypothesis.

According to somatomedin hypothesis the anabolic actions are mediated by IGF. Some effects of growth hormones are independent of IGF activity, such as enhancement of lipolysis, stimulation of amino-acid transport in diaphragm and enhancement of protein synthesis.
Specific receptor for IGF have been identified. "Type 1" receptor is similar to insulin receptor and binds preferentially IGF1, but also binds IGF2 and insulin with lower affinity.

Type 2 receptor is different, it binds IGF2 preferentially, IGF1 with low affinity and does not bind insulin. IGF1 is predominantly responsible for the growth promoting effect of growth hormones, whereas, IGF2 may mediate other metabolic actions of growth hormones. Growth hormone is detectable in fetal serum at the end of first trimester and its concentration rises rapidly to reach a peak of 100 – 150 ngm / L at about 20 week of gestation (Gluckman et al, 1981). Mean levels decrease to about 30 ngm / L in cord serum at term and continue to fall during the early postnatal months. (Michael O. Thorner).

Although growth hormone is not necessary for somatic growth in first six months of life but its alteration in perinatal asphyxia, abnormal mode of delivery, degree of apgar score, prematurity, congenital central nervous system infection have been reported in the recent past, which may affect the somatic growth of neonate later on.