Pituitary transcription factor

Pituitary transcription factors are a group of proteins that play a crucial role in the development and function of the pituitary gland, a small but essential endocrine gland located at the base of the brain. These transcription factors are responsible for regulating the expression of specific genes involved in the development and differentiation of different pituitary cell types, as well as in the synthesis and secretion of pituitary hormones.

Here are some of the key pituitary transcription factors:

Pit-1 (POU1F1): Pit-1 is a transcription factor that is essential for the development and functioning of somatotrophs (cells that produce growth hormone), lactotrophs (cells that produce prolactin), and thyrotrophs (cells that produce thyroid-stimulating hormone or TSH). Mutations in the POU1F1 gene can lead to hormone deficiencies.

PROP1 (Prophet of PIT-1): PROP1 is involved in the development of several pituitary cell types, including somatotrophs, lactotrophs, thyrotrophs, and gonadotrophs (cells that produce gonadotropins). Mutations in the PROP1 gene are associated with multiple pituitary hormone deficiencies.

HESX1: HESX1 is important for the early development of the pituitary gland and the hypothalamus. Mutations in HESX1 can lead to septo-optic dysplasia, a condition characterized by various pituitary and visual system abnormalities.

GLI2: GLI2 is involved in the development of the anterior pituitary and is associated with holoprosencephaly, a congenital malformation involving the brain and face.

LHX3 and LHX4: LHX3 and LHX4 are transcription factors that play a role in the development of the anterior pituitary, particularly in specifying the corticotroph and somatotroph cell lineages.

NR5A1 (SF-1): While primarily known for its role in the development of the adrenal and gonadal glands, NR5A1 also plays a role in pituitary development and function.

These transcription factors are essential for the proper development of the pituitary gland and the regulation of hormone production. Mutations or abnormalities in the genes encoding these transcription factors can result in various pituitary disorders and hormonal imbalances, which may require medical intervention and hormone replacement therapy to manage the associated health issues.

The 2022 World Health Organization classification of tumors of the pituitary gland provides detailed histological subtyping of a PitNET based on the tumor cell lineage, cell type, and related characteristics. The routine use of immunohistochemistry for pituitary transcription factors (PIT1, TPIT, SF1, GATA3, and ERα) is endorsed in this classification. The major PIT1, TPIT, and SF1 lineage-defined PitNET types and subtypes feature distinct morphologic, molecular, and clinical differences. The "null cell" tumor, which is a diagnosis of exclusion, is reserved for PitNETs with no evidence of adenohypophyseal lineage differentiation. Unlike the 2017 WHO classification, mammosomatotroph stem cell tumors and acidophil stem cell tumors represent distinct PIT1-lineage PitNETs. The diagnostic category of PIT1-positive plurihormonal tumor that was introduced in 2017 WHO

classification is replaced by two clinicopathologically distinct PitNETs: the immature PIT1-lineage tumor (formerly known as silent subtype 3 tumors) and the mature plurihormonal PIT1-lineage tumor.

Rare unusual plurihormonal tumors feature multi-lineage differentiation. The importance of recognizing multiple synchronous PitNETs is emphasized to avoid misclassification. The term "metastatic PitNET" is advocated to replace the previous terminology "pituitary carcinoma" in order to avoid confusion with neuroendocrine carcinoma (a poorly differentiated epithelial neuroendocrine neoplasm). Subtypes of PitNETs that are associated with a high risk of adverse biology are emphasized within their cell lineage and cell type as well as based on clinical variables. Posterior lobe tumors, the family of pituicyte tumors, include the traditional pituicytoma, the oncocytic form (spindle cell oncocytoma), the granular cell form (granular cell tumor), and the ependymal type (sellar ependymoma). Although these historical terms are entrenched in the literature, they are nonspecific and confusing, such that oncocytic pituicytoma, granular cell pituicytoma, and ependymal pituicytoma are now proposed as more accurate. Tumors with hypothalamic neuronal differentiation are classified as gangliocytomas or neurocytomas based on large and small cell sizes, respectively. This classification sets the standard for a high degree of sophistication to allow individualized patient management approaches [1)]

1)
Asa SL, Mete O, Perry A, Osamura RY. Overview of the 2022 WHO Classification of Pituitary Tumors. Endocr Pathol. 2022 Mar;33(1):6-26. doi: 10.1007/s12022-022-09703-7. Epub 2022 Mar 15. PMID: 35291028.