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Gene Section
Short Communication

POU3F2 (POU class 3 homeobox 2)

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Abstract

POU3F2, also known as BRN2, Oct7, and N-Oct3, is a member of the neural cell-specific class III POU domain transcription factors (Ryan and Rosenfeld, 1997). POU3F2-knockout causes the loss of specific neuronal lineages in the endocrine hypothalamus and the subsequent loss of the posterior pituitary gland (Nakai et al., 1995; Schonemann et al., 1995; Alvarez-Bolado et al., 1995). And also, transgenes of POU3F2 and some other few factors converted non-neural cells to neural cells in vitro (Ambasudhan et al., 2011; Lujan et al., 2012; Pang et al., 2011). These results indicate that POU3F2 is an indispensable transcription factor for neural differentiation and generation of normal nervous system, especially hypothalamus. There have been a few reports regarding the functions of POU3F2 in association with tumorigenesis. POU3F2 has been demonstrated to be an oncogene in malignant melanomas derived from the neuroectodermal cell lineage and to accelerate the growth of melanoma cells (Cook and Sturm, 2008). POU3F2 are also highly expressed in small cell lung cancers and closely associated with the cancer specific neural/neuroendocrine phenotype (Schreiber et al., 1992; Ishii et al., 2013; Sakaeda et al., 2013).

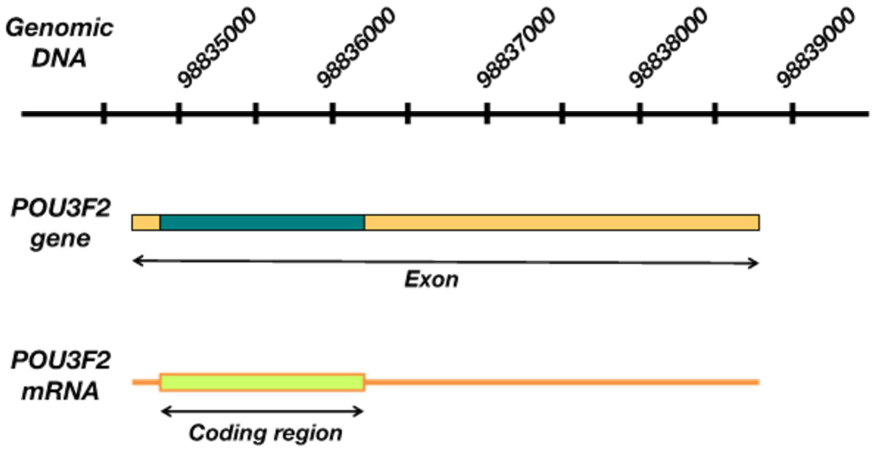
Keywords
Transcription factor, POU domain, nervous system, neural development, hypothalamus, melanoma, small cell lung cancer, neuroendocrine

Identity

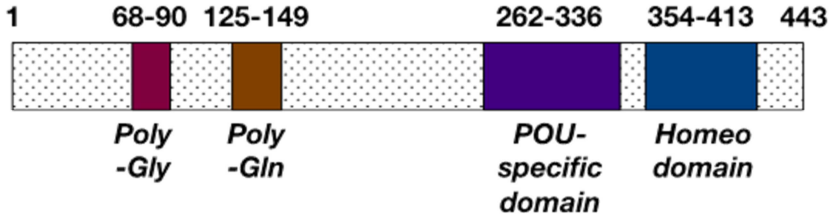
Other names: BRN2, N-Oct3, OCT7, OTF-7, OTF7, POUF3, brn-2, oct-7

HGNC (Hugo): POU3F2

Location: 6q16.1



Schematic representation of POU3F2 gene and mRNA. The POU3F2 gene is located on the plus strand of 6q16.1 chromosome. It consists of one exon (4086 bp).



Schematic illustrating POU3F2 protein. POU3F2 has poly-glycine and glutamic acid repeat in N-terminal side and POU-specific domain and homeodomain in C-terminal side.

DNA/RNA

Description

POU3F2 is intron-less gene. Coding region is located in 5' side of the gene.

Transcription

4108 base mRNA, coding sequence is 1332 base. There are no reports about transcriptional variant.

Protein

Description

POU3F2 belongs to the Class-III POU transcription factor family. All class-III POUs mainly express in some part of nervous system and regulate the development (Dominguez et al., 2013; Phippard et al., 1999). Two DNA binding domain, POU-specific domain, and homeodomain are conserved in POU transcription factor family.

Expression

POU3F2 expresses in developing nervous system and hypothalamus (Andersen and Rosenfeld, 2001). It also localizes in the developing mouse spinal cord (Tanaka et al., 2004).

Localisation

POU3F2 mainly localizes in nuclei.

Function

POU3F2 makes homodimer or heterodimer with other transcription factor and recognize specific DNA motif. POU3F2 activates the transcription of near gene. It is reported that target genes of POU3F2 are some neural genes (Blaud et al., 2004), phosphodiesterase 5A (Arozarena et al., 2011), cadherin 13 (Ellmann et al., 2012), NKX2.1 (Sakaeda et al., 2013).

Homology

POU3F2 shows highly similarity with the other class-III POU proteins (POU3F1, POU3F3, POU3F4) especially in the DNA binding domain.

Mutations

Note

There is no report about mutation of POU3F2.

Implicated in

Melanoma

Note

POU3F2 is highly expressed in melanoma cells and is related to the tumorigenesis and the growth (Cook and Sturm, 2008).

Suppression of POU3F2 reduced proliferation activity and tumorigenic potential of melanoma cells (Thomson et al., 1995).

It is reported that high POU3F2 expression is due to the activation of MAPK signaling pathway associated with BRAF gene mutation (Goodall et al., 2004).

Small cell lung cancer

Note

Small cell lung cancer (SCLC) highly expresses POU3F2 compared with non-SCLC. POU3F2 induces several neuroendocrine specific transcription factors and marker molecules and is associated to the cell viability (Schreiber et al., 1992; Ishii et al., 2013; Sakaeda et al., 2013).

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