

Gene Section

Mini Review

NDRG2 (NDRG family member 2)

Libo Yao, Lifeng Wang, Jiang Zhang, Na Liu

Department of Biochemistry and Molecular Biology, The State Key Laboratory of Cancer Biology, The Fourth Military Medical University, Xi'an, Shaanxi 710032, P.R. China (LY, LW, JZ, NL)

Published in Atlas Database: June 2005

Online updated version: <http://AtlasGeneticsOncology.org/Genes/NDRG2ID41513ch14q11.html>

DOI: 10.4267/2042/38235

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Identity

Other names: SYLD; KIAA1248; DKFZp781G1938; HGNC 14460

HGNC (Hugo): NDRG2

Location: 14q11.2

DNA/RNA

Description

The gene encompasses 9013 bp of DNA; 16 or 17 exons (the first and second are non-coding).

Transcription

Eight splicing mRNAs are found.

2142 bp mRNA; CDS: 174-1289bp; 1113 bp open reading frame

2100 bp mRNA; CDS: 174-1247bp; 1071 bp open reading frame

2033 bp mRNA; CDS: 107-1180bp; 1071 bp open reading frame

2075 bp mRNA; CDS: 107-1222bp; 1113 bp open reading frame

2010 bp mRNA; CDS: 84-1157bp; 1071 bp open reading frame

2052 bp mRNA; CDS: 84-1199bp; 1113 bp open reading frame

2119 bp mRNA; CDS: 151-1266bp; 1113 bp open reading frame

2077 bp mRNA; CDS: 151-1224bp; 1071 bp open reading frame.

Protein

Description

357 amino acids; another isoform has 371 amino acids; 40 or 43 kDa; Thr348 is a Akt phosphorylation site,

Ser332 is a PKC tetra-phosphorylation site. NDRG2 has the alpha/beta hydrolase fold motif.

Expression

Widely expressed, especially in brain, heart, skeletal muscle and kidney.

Localisation

Cytosol.

Function

A candidate tumor suppressor gene. NdrG2 expressed much higher in normal tissues than the tumors (brain, liver, pancreas tissues etc). Overexpression of ndrg2 can inhibit the proliferation of glioblastoma U373 and U138 cells. NDRG2 upregulation is associated with disease pathogenesis in the human brain. NdrG2 is expressed during the differentiation of DCs, and the expression is differentially regulated by maturation-inducing stimuli such as LPS and CD40. The expression of ndrg2 in rat frontal cortex was decreased by chronic antidepressant treatment.

Homology

At the amino acid level, human NDRG2 shows 57% identical to NDRG1 and NDRG3, 65% identical to NDRG4-B, 63% identical to NDRG4-Bvar and 61% identical to NDRG4-H respectively. Also human NDRG2 shows 92% identical to mouse NDRG2.

Implicated in

Alzheimer's disease

Disease

Alzheimer's disease is the most common cause of dementia. Dementia is a collective name for progressive degenerative brain syndromes, which affect memory, thinking, behavior and emotion. Symptoms

may include: 1) lose of memory; 2) difficulty in finding the right words or understanding what people are saying; 3) difficulty in performing previously routine tasks; 4) personality and mood changes.

Prognosis

The probable outcome is poor. The disorder is usually not acute, but progresses steadily. Total disability is common. Death normally occurs within 15 years, usually from an infection or a failure of other body systems. The duration of illness, from onset of symptoms to death, averages 8 to 10 years.

Hybrid/Mutated gene

NDRG2 is upregulated at both the RNA and protein levels in AD brains. Expression of NDRG2 in affected brains was revealed in: (1) cortical pyramidal neurons, (2) senile plaques and (3) cellular processes of dystrophic neurons. NDRG2 upregulation is associated with disease pathogenesis in the human brain.

Liver cancers

Disease

Liver cancers are primary liver tumors (hepatoma/hepatocellular carcinoma, bile duct cancer/cholangio-carcinoma) or metastatic liver tumor.

Oncogenesis

Compared with adjacent normal tissues, the expression levels of NDRG2 mRNA in liver cancer tissues reduced significantly, but the mutation in the whole coding region of NDRG2 was not found.

Glioblastoma

Disease

Glioblastoma multiforme (GBM) is the most aggressive form of the primary brain tumors known collectively as gliomas. These tumors arise from the supporting, glial cells of the brain during childhood and in adults. These growths do not spread throughout the body like other forms of cancer, but cause symptoms by invading the brain. NDRG2 gene was first found in this tissue by using subtraction cloning.

Oncogenesis

Ndr2 is present at low levels in human GBM tissues and glioblastoma cell lines comparing with normal tissue and cells. Transient transfection exogenous NDRG2 gene will inhibits glioblastoma U373 and U138 cells proliferation.

Gastric cancer

Disease

Gastric cancer is the result of cell changes in the lining of the stomach. The most common types of stomach cancer start in the glandular cells of the stomach lining and are known as adenocarcinomas. These are rare cancers that usually start from the cells of the muscle layer of the stomach. The most common type of sarcoma to affect the stomach is a leiomyosarcoma.

Another type of sarcoma is a gastrointestinal stromal tumour (GIST).

Oncogenesis

Ndr2 is present at low level in some stomach cancer tissue and cell lines.

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- This article should be referenced as such:*
- Yao L, Wang L, Zhang J, Na Liu N. NDRG2 (NDRG family member 2). *Atlas Genet Cytogenet Oncol Haematol.* 2005; 9(4):279-280.
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