Atlas of Genetics and Cytogenetics in Oncology and Haematology

OPEN ACCESS JOURNAL AT INIST-CNRS

Gene Section

Review

CITED2 (Cbp/p300-interacting transactivator, with Glu/Asp-rich carboxy-terminal domain, 2)

Matthias Haase, Holger S Willenberg

Department of Endocrinology, Diabetes and Rheumatology, University Hospital Duesseldorf, 40225 Duesseldorf, Germany (MH, HSW)

Published in Atlas Database: January 2010

Online updated version : http://AtlasGeneticsOncology.org/Genes/CITED2ID40087ch6q24.html
DOI: 10.4267/2042/44865

Identity

Other names: MRG1; MRG-1; p35srj

HGNC (Hugo): CITED2

Location: 6q24.1

Note: CITED2 was mapped to 6q23.3 by fluorescence in situ hybridization, a weaker signal was detected at 1q22 (Leung et al., 1999).

The MRG1 isoform was isolated in 1996 from human melanocyte cDNA based on the homology to the melanocyte-specific gene 1 (MSG1, Shioda et al., 1996). The p35srj isoform has been identified in 1999 (Bhattacharya et al., 1999). The CITED2 gene that encodes p35srj and MRG1 has been cloned in 1999 (Leung et al., 1999).

DNA/RNA

Description

The CITED2-Gene is composed of three exons and two introns. The gene encompasses 9,39 kb of DNA. The promoter contains hypoxia response elements, SP1 binding sites, STAT binding sites and a NFkappaB binding site (Leung et al., 1999).

Transcription

By splicing processes two different transcripts are generated: in the p35srj-transcript there is only one intron spliced out and it still contains the intron 2 coding for a serine rich junction (srj). In the MRG1-transcript both introns are spliced out (Leung et al., 1999).

Protein

Description

Isoform p35srj: 270 aa, 28,5 kDa (molecular weight calculated by amino acid sequence).
Isoform MRG1: 213 aa, 23,73 kDa (molecular weight calculated by amino acid sequence).

Expression

Widely expressed, developmental regulated.

Localisation

Predominantly nuclear.

Function

Transcriptional co-regulator. The CITED2 isoform p35srj binds to p300/CBP and inhibits HIF-1alpha transactivation (Bhattacharya et al., 1999). CITED2 competes with HIF-1alpha for an overlapping binding site on the cysteine-histidine-rich 1 domain of p300 (Freedman et al., 2003). CITED2 was identified as a co-activator of all isoforms of the transcription factor AP-2 (TFAP2, Bamforth et al., 2001; Braganca et al., 2003). Overexpression of MRG1 resulted in tumor formation in nude mice (Sun et al., 1998). CITED2 controls fibroblast proliferation by the regulation of the proliferation inhibitors INK4a/ARF and the polycomb-group genes BMI1/Mel18 (Kranc et al., 2003). CITED2 is a co-regulator of the peroxisome proliferator-activated receptor alpha (PPARalpha) and increases proliferation in hepatocytes (Tien et al., 2004). CITED2 regulates the Nodal-Pitx2c pathway and controls

developmental processes (Bamforth et al., 2004). CITED2 is a co-activator of Smad3/p300 transcription and modulates metalloproteinase 9 expression in a transforming growth factor beta (TGF-beta) dependent pathway (Chou et al., 2006).

Mutations

Germinal

Amino acid changing mutations (p.Ser170_Gly178del, p.Gly178_Ser179ins9 and p.Ser198_Gly199del) in the serine-glycine-rich junction of the protein. The mutants show decreased transrepression of HIF-1a or decreased coactivation of TFAP2. The mutations mentioned above have been detected in patients suffering from congenital heart defects (cardiac septal defects) but not in normal individuals (Sperling et al., 2005).

Implicated in

Adrenocortical carcinoma

Note

CITED2 is expressed in adrenocortical carcinomas as well as in the adrenocortical carcinoma cell line NCI-H295R. CITED2 is upregulated by bFGF, Forskolin, endothelial cell products and Angiotensin II in NCI-H295R cells (Haase et al., 2007; Romero et al., 2007; Haase et al., 2009). In part, CITED2-expression in adrenocortical carcinomas could be observed in close proximity to blood vessels (Haase et al., 2009).

Breast cancer

Note

CITED2 is highly expressed in MDA-MB-231 invasive breast cancer cells which are resistant to TGF-beta mediated growth arrest. TGF-beta induced MDA-MB-231 cell invasion could be reduced by downregulation of CITED2 as an enhancer of metalloproteinase 9 (MMP9)-expression, suggesting a role for CITED2 during tumor invasion (Chou et al., 2005). In Fibroblasts and in breast cancer cells FOXO3a inhibits HIF-1 induced apoptosis via upregulation of CITED2 (Bakker et al., 2007). CITED2 was especially expressed in human breast cancer cell lines that form osteolytic metastases in animal models. Elevated expression of CITED2 could also be observed in invasive ductal carcinoma tissue samples and in breast cancer bone metastases in comparison to normal mammary epithelial tissues (Lau et al., 2010). A study from Agthoven et al., observed that high levels of CITED2 mRNA in oestrogen receptor-alpha positive breast tumors of lymph-node negative patients were associated with prolonged metastasis-free-survival. In the same study high levels of CITED2 mRNA were also associated with a favourable outcome in patients that have received Tamoxifen as a first line therapy (van Agthoven et al., 2009).

Colorectal cancer

Note

In a human colorectal carcinoma cell line CITED2 is downregulated by Rac1, a protein that has been associated with tumor growth (Gomez del Pulgar et al., 2007). In the human colon cancer cell line RKO downregulation of CITED2 increased colon cancer cell invasivness and upregulated MMP-13 expression (Bai et al., 2007).

Esophageal cancer

Note

CITED2 was downregulated in a well and a poorly differentiated esophageal cancer cell line after treatment with up to 8 Gy irradiation (Bo et al., 2004).

Leiomyoma

Note

GnRHa therapy increased CITED2 expression in leiomyoma and myometrium. GnRHa therapy had a biphasic effect on CITED2 expression in primary cultures of myometrial smooth muscle cells and inhibits expression in primary cultures of leiomyoma smooth muscle cells (Luo et al., 2005b). Expression of CITED2 was downregulated by TGF-beta in primary cultures of myometrial and leiomyoma smooth muscle cells (Luo et al., 2005a).

Osteosarcoma

Note

CITED2 is downregulated in radiation-induced rat osteosarcoma as compared with normal osteoblasts (Daino et al., 2009). The analysis of radiation-induced rat osteosarcoma showed reduced mRNA and protein expression and suggests a role for CITED2 as a tumor supressor gene in osteosarcoma (Daino et al., 2009).

Ovarian carcinoma

Note

CITED2 expression was significantly downregulated after silencing of the tumor susceptibility gene 101 protein (TSG101) in SKOV-3 ovarian cancer cells with elevated RAS activity. The downregulation of CITED2 went along with a decrease of cell viability (Young et al., 2007). Expression of CITED2 was elevated in the oxaliplatin resistant cell line KFR as compared with the oxaliplatin sensitive cell line KF-1. The downregulation of CITED2 in the platinum-resistent ovarian cancer cell line KFR enhances the cytotoxicity of platinum compounds to the KFR cell line (Yanangie et al., 2009).

Sarcoma

Note

Ewing's-Sarcoma shows a 6-fold increase in CITED2-expression as compared with rhabdomyosarcoma (Baer et al., 2004).

Adrenal development and adrenocortical physiology

Note

CITED2-null mice show adrenal agenesis indicating a role for CITED2 within adrenal development (Bamforth et al., 2001). At 8 weeks of gestation CITED2 could be detected especially within the definitive zone of the developing adrenal cortex (Haase et al., 2007). Following studies confirmed the expression of CITED2 during early human fetal adrenal gland development at 7 and 10 weeks of gestation (Ferraz-de-Souza et al., 2009). In mice CITED2 was expressed in the coelomic epithelium and in the nephrogenic mesenchyme at E10. At E12 CITED2 was highly expressed in the adrenal primordium and remained highly expressed in adrenocortical cells at E13.5 and later (Val et al., 2007). In mice CITED2 acts as a WT-1 co-factor to increase SF-1 levels in the adrenogonadal primordium to initiate adrenal development (Val et al., 2007). Other studies applying human NCI-H295R adrenal carcinoma cells demonstrate that SF-1 activates the CITED2-promoter (Ferraz-de-Souza et al., 2009). In human NCI-H295R cells CITED2-expression is regulated by basic fibroblast growth factor, endothelial cell products and is dependent on the MAPK-pathway (Haase et al., 2007; Haase et al., 2009). Forskolin could also be identified as a positive regulator of CITED2-expression in NCI-H295R cells (Haase et al., 2007; Romero et al., 2007). Angiotensin II upregulates CITED2-expression in NCI-H295R cells and CITED2 enhances the expression of steroidogenic enzymes such as 11-beta-Hydroxylase and Aldosterone-Synthase (Romero et al., 2007).

Congenital heart defects and cardiac septal defects

Note

CITED2 -/- mice show cardiac malformations including ventricular and atrial septal defects, double-outlet right ventricle, overriding aorta, right sided aortic arches and persistent truncus arteriosus (Bamforth et al., 2001). Functional loss of CITED2 during transrepression of HIF-1 alpha has been suggested to be responsible for the observed phenotype (Yin et al., 2002). Aberrant signaling of the Nodal-Pitx2c pathway has also been linked to the cardiovascular defects observed in CITED2 -/- mice (Bamforth et al., 2004). Aberrant left-right patterning as well as direct loss of CITED2 in cardiac tissues has been associated with the defects in CITED2-null mice (Weninger et al., 2005). The
cardiovascular defects seem to result from the disruption of left-right patterning in epiblast derivatives and from the malfunction of septation in the mesoderm (MacDonald et al., 2008).

Mutations of CITED2 in humans have been linked to cardiac septal defects and congenital heart defects (Sperling et al., 2005).

Exencephaly, neural crest defects and neurologic implications

Note

CITED2-null mice show exencephaly, abnormal cranial ganglia, neural crest defects and increased apoptosis in the midbrain region (Bamforth et al., 2001). Exencephaly seem to arise from defective closure of the midbrain and hindbrain region, associated with a defective closure of the neural tube (Barbera et al., 2002). Apoptosis around the Forebrain-Midbrain-junction in the dorsal neuroectoderm was increased in CITED2 -/- mice and CITED2 was necessary for the survival of neuroepithelial cells (Barbera et al., 2002). The administration of folic acid significantly reduced exencephaly in CITED2-null mice (Barbera et al., 2002). Transient forebrain ischemia induced CITED2-expression in different brain regions including the piriform cortex and the dentate gyrus of the hippocampal region and it has been speculated if CITED2 protects from neuronal death under hypoxic conditions (Sun et al., 2006). However, other studies also demonstrate that CITED2-overexpression can promote cell death in cortical neurons of the mouse (Gonzales et al., 2008). CITED2 expression is increased after olfactory bulbectomy and may contribute to the phenotype of basal progenitor cells of the olfactory sensory neuron lineage in the mouse (Shetty et al., 2005). CITED2 was also identified as a neural activity-dependent transcription-factor in vivo and in vitro in rat cortical neurons (Sun et al., 2007).

Eye developement

Note

CITED2 is necessary for the morphogenesis of the lens and for hyaloid vasculature formation (Chen et al., 2008). Selective deletion of CITED2 resulted in abnormal corneal epithelial differentiation, impaired wound healing and corneal neovascularization in older mice associated with decreased expression of Pax6 and Klf4 (Chen et al., 2009).

Fracture healing

Note

CITED2 was identified as a negative regulator of fracture healing in rats and was inversly related to the expression of metalloproteinases (MMP-2, MMP-3, MMP-9, MMP-13), HIF-1a, VEGF, RANK-L, M-CSF and OPG (Lee et al., 2009).

Gonadal development

Note

In CITED2 null mice XY-gonad development was delayed and testis structure was disorganized. In XX-

gonads of CITED2 null mice cell migration was disturbed (Combes et al., 2009). CITED2 interacts with Wt1 and SF-1 in mice and increases Sry levels initiating testes development (Buaas et al., 2009).

Hematopoiesis

Note

CITED2 is required for the regulation of hematopoeisis during embryogenesis in the murine fetal liver (Chen et al., 2007). CITED2 controls adult hematopoietic stem cell function via Ink4a/Arf and Trp53 (Kranc et al., 2009).

Liver development

Note

CITED2 null mice show liver hypoplasia, increased apoptosis, disrupted sinusoidal architecture, disrupted cell-cell contacts, impaired lipid metabolism and gluconeogenesis. The observations have been linked to the role of CITED2 as a co-activator of HNF4alpha (Qu et al., 2007).

Lung development

Note

CITED2 is required for fetal lung maturation. Terminal sac space and differentiation of alveolar epithelial cells Typ 1 and 2 is altered in CITED2 null lungs in mice (Xu et al., 2008). CITED2 is developmentally regulated in pulmonary artery smooth muscle cells in sheep with higher expression in the fetus compared with the adult (Resnik et al., 2007).

References

Shioda T, Fenner MH, Isselbacher KJ. msg1, a novel melanocyte-specific gene, encodes a nuclear protein and is associated with pigmentation. Proc Natl Acad Sci U S A. 1996 Oct 29;93(22):12298-303

Sun HB, Zhu YX, Yin T, Sledge G, Yang YC. MRG1, the product of a melanocyte-specific gene related gene, is a cytokine-inducible transcription factor with transformation activity. Proc Natl Acad Sci U S A. 1998 Nov 10;95(23):13555-60

Bhattacharya S, Michels CL, Leung MK, Arany ZP, Kung AL, Livingston DM. Functional role of p35srj, a novel p300/CBP binding protein, during transactivation by HIF-1. Genes Dev. 1999 Jan 1;13(1):64-75

Leung MK, Jones T, Michels CL, Livingston DM, Bhattacharya S. Molecular cloning and chromosomal localization of the human CITED2 gene encoding p35srj/Mrg1. Genomics. 1999 Nov 1;61(3):307-13

Bamforth SD, et al. Cardiac malformations, adrenal agenesis, neural crest defects and exencephaly in mice lacking Cited2, a new Tfap2 co-activator. Nat Genet. 2001 Dec;29(4):469-74

Barbera JP, Rodriguez TA, Greene ND, Weninger WJ, Simeone A, Copp AJ, Beddington RS, Dunwoodie S. Folic acid prevents exencephaly in Cited2 deficient mice. Hum Mol Genet. 2002 Feb 1;11(3):283-93

Yin Z, Haynie J, Yang X, Han B, Kiatchoosakun S, Restivo J, Yuan S, Prabhakar NR, Herrup K, Conlon RA, Hoit BD, Watanabe M, Yang YC. The essential role of Cited2, a negative regulator for HIF-1alpha, in heart development and neurulation. Proc Natl Acad Sci U S A. 2002 Aug 6;99(16):10488-93

Bragança J, Eloranta JJ, Bamforth SD, Ibbitt JC, Hurst HC, Bhattacharya S. Physical and functional interactions among AP-2 transcription factors, p300/CREB-binding protein, and CITED2. J Biol Chem. 2003 May 2;278(18):16021-9

Freedman SJ, Sun ZY, Kung AL, France DS, Wagner G, Eck MJ. Structural basis for negative regulation of hypoxia-inducible factor-1alpha by CITED2. Nat Struct Biol. 2003 Jul;10(7):504-12

Kranc KR, Bamforth SD, Bragança J, Norbury C, van Lohuizen M, Bhattacharya S. Transcriptional coactivator Cited2 induces Bmi1 and Mel18 and controls fibroblast proliferation via Ink4a/ARF. Mol Cell Biol. 2003 Nov;23(21):7658-66

Baer C, Nees M, Breit S, Selle B, Kulozik AE, Schaefer KL, Braun Y, Wai D, Poremba C. Profiling and functional annotation of mRNA gene expression in pediatric rhabdomyosarcoma and Ewing's sarcoma. Int J Cancer. 2004 Jul 10;110(5):687-94

Bamforth SD, Bragança J, Farthing CR, Schneider JE, Broadbent C, Michell AC, Clarke K, Neubauer S, Norris D, Brown NA, Anderson RH, Bhattacharya S. Cited2 controls left-right patterning and heart development through a Nodal-Pitx2c pathway. Nat Genet. 2004 Nov;36(11):1189-96

Bo H, Ghazizadeh M, Shimizu H, Kurihara Y, Egawa S, Moriyama Y, Tajiri T, Kawanami O. Effect of ionizing irradiation on human esophageal cancer cell lines by cDNA microarray gene expression analysis. J Nippon Med Sch. 2004 Jun;71(3):172-80

Tien ES, Davis JW, Vanden Heuvel JP. Identification of the CREB-binding protein/p300-interacting protein CITED2 as a peroxisome proliferator-activated receptor alpha coregulator. J Biol Chem. 2004 Jun 4;279(23):24053-63

Luo X, Ding L, Xu J, Chegini N. Gene expression profiling of leiomyoma and myometrial smooth muscle cells in response to transforming growth factor-beta. Endocrinology. 2005 Mar;146(3):1097-118

Luo X, Ding L, Xu J, Williams RS, Chegini N. Leiomyoma and myometrial gene expression profiles and their responses to gonadotropin-releasing hormone analog therapy. Endocrinology. 2005 Mar;146(3):1074-96

Shetty RS, Bose SC, Nickell MD, McIntyre JC, Hardin DH, Harris AM, McClintock TS. Transcriptional changes during neuronal death and replacement in the olfactory epithelium. Mol Cell Neurosci. 2005 Dec;30(4):583-600

Sperling S, Grimm CH, Dunkel I, Mebus S, Sperling HP, Ebner A, Galli R, Lehrach H, Fusch C, Berger F, Hammer S. Identification and functional analysis of CITED2 mutations in patients with congenital heart defects. Hum Mutat. 2005 Dec;26(6):575-82

Weninger WJ, Lopes Floro K, Bennett MB, Withington SL, Preis JI, Barbera JP, Mohun TJ, Dunwoodie SL. Cited2 is required both for heart morphogenesis and establishment of the left-right axis in mouse development. Development. 2005 Mar;132(6):1337-48

Chou YT, Wang H, Chen Y, Danielpour D, Yang YC. Cited2 modulates TGF-beta-mediated upregulation of

MMP9. Oncogene. 2006 Sep 7;25(40):5547-60

Sun W, Kim KH, Noh M, Hong S, Huh PW, Kim Y, Kim H. Induction of CITED2 expression in the rat hippocampus following transient global ischemia. Brain Res. 2006 Feb 9;1072(1):15-8

Bai L, Merchant JL. A role for CITED2, a CBP/p300 interacting protein, in colon cancer cell invasion. FEBS Lett. 2007 Dec 22;581(30):5904-10

Bakker WJ, Harris IS, Mak TW. FOXO3a is activated in response to hypoxic stress and inhibits HIF1-induced apoptosis via regulation of CITED2. Mol Cell. 2007 Dec 28;28(6):941-53

Chen Y, Haviernik P, Bunting KD, Yang YC. Cited2 is required for normal hematopoiesis in the murine fetal liver. Blood. 2007 Oct 15;110(8):2889-98

Gómez del Pulgar T, Bandrés E, Espina C, Valdés-Mora F, Pérez-Palacios R, García-Amigot F, García-Foncillas J, Lacal JC. Differential expression of Rac1 identifies its target genes and its contribution to progression of colorectal cancer. Int J Biochem Cell Biol. 2007;39(12):2289-302

Haase M, Schott M, Bornstein SR, Malendowicz LK, Scherbaum WA, Willenberg HS. CITED2 is expressed in human adrenocortical cells and regulated by basic fibroblast growth factor. J Endocrinol. 2007 Feb;192(2):459-65

Qu X, Lam E, Doughman YQ, Chen Y, Chou YT, Lam M, Turakhia M, Dunwoodie SL, Watanabe M, Xu B, Duncan SA, Yang YC. Cited2, a coactivator of HNF4alpha, is essential for liver development. EMBO J. 2007 Oct 31;26(21):4445-56

Resnik ER, Herron JM, Lyu SC, Cornfield DN. Developmental regulation of hypoxia-inducible factor 1 and prolyl-hydroxylases in pulmonary vascular smooth muscle cells. Proc Natl Acad Sci U S A. 2007 Nov 20;104(47):18789-94

Romero DG, Rilli S, Plonczynski MW, Yanes LL, Zhou MY, Gomez-Sanchez EP, Gomez-Sanchez CE. Adrenal transcription regulatory genes modulated by angiotensin II and their role in steroidogenesis. Physiol Genomics. 2007 Jun 19;30(1):26-34

Sun W, Choi SH, Park SK, Kim SJ, Noh MR, Kim EH, Kim HJ, Kim H. Identification and characterization of novel activity-dependent transcription factors in rat cortical neurons. J Neurochem. 2007 Jan;100(1):269-78

Val P, Martinez-Barbera JP, Swain A. Adrenal development is initiated by Cited2 and Wt1 through modulation of Sf-1 dosage. Development. 2007 Jun;134(12):2349-58

Young TW, Mei FC, Rosen DG, Yang G, Li N, Liu J, Cheng X. Up-regulation of tumor susceptibility gene 101 protein in ovarian carcinomas revealed by proteomics analyses. Mol Cell Proteomics. 2007 Feb;6(2):294-304

Chen Y, et al. Cited2 is required for the proper formation of the hyaloid vasculature and for lens morphogenesis. Development. 2008 Sep;135(17):2939-48

Gonzalez YR, Zhang Y, Behzadpoor D, Cregan S, Bamforth S, Slack RS, Park DS. CITED2 signals through peroxisome proliferator-activated receptor-gamma to regulate death of cortical neurons after DNA damage. J Neurosci. 2008 May 21;28(21):5559-69

MacDonald ST, Bamforth SD, Chen CM, Farthing CR, Franklyn A, Broadbent C, Schneider JE, Saga Y, Lewandoski M, Bhattacharya S. Epiblastic Cited2 deficiency results in cardiac phenotypic heterogeneity and provides a mechanism for haploinsufficiency. Cardiovasc Res. 2008 Aug 1;79(3):448-57

Xu B, Qu X, Gu S, Doughman YQ, Watanabe M, Dunwoodie SL, Yang YC. Cited2 is required for fetal lung maturation. Dev Biol. 2008 May 1;317(1):95-105

Buaas FW, Val P, Swain A. The transcription co-factor CITED2 functions during sex determination and early gonad development. Hum Mol Genet. 2009 Aug 15;18(16):2989-3001

Chen Y, Carlson EC, Chen ZY, Hamik A, Jain MK, Dunwoodie SL, Yang YC. Conditional deletion of Cited2 results in defective corneal epithelial morphogenesis and maintenance. Dev Biol. 2009 Oct 1;334(1):243-52

Daino K, Ugolin N, Altmeyer-Morel S, Guilly MN, Chevillard S. Gene expression profiling of alpha-radiation-induced rat osteosarcomas: identification of dysregulated genes involved in radiation-induced tumorigenesis of bone. Int J Cancer. 2009 Aug 1;125(3):612-20

Ferraz-de-Souza B, et al. CBP/p300-interacting transactivator, with Glu/Asp-rich C-terminal domain, 2, and pre-B-cell leukemia transcription factor 1 in human adrenal development and disease. J Clin Endocrinol Metab. 2009 Feb;94(2):678-83

Haase M, Ansurudeen I, Schinner S, Paramonova I, Schott M, Papewalis C, Bornstein SR, Scherbaum WA, Willenberg HS. Evidence for the involvement of endothelial cell products in adrenal CITED2 expression. Cell Tissue Res. 2009 May;336(2):337-43

Kranc KR, Schepers H, Rodrigues NP, Bamforth S, Villadsen E, Ferry H, Bouriez-Jones T, Sigvardsson M, Bhattacharya S, Jacobsen SE, Enver T. Cited2 is an essential regulator of adult hematopoietic stem cells. Cell Stem Cell. 2009 Dec 4;5(6):659-65

Lee JY, Taub PJ, Wang L, Clark A, Zhu LL, Maharam ER, Leong DJ, Ramcharan M, Li Z, Liu Z, Ma YZ, Sun L, Zaidi M, Majeska RJ, Sun HB. Identification of CITED2 as a negative regulator of fracture healing. Biochem Biophys Res Commun. 2009 Oct 2;387(4):641-5

van Agthoven T, Sieuwerts AM, Veldscholte J, Meijer-van Gelder ME, Smid M, Brinkman A, den Dekker AT, Leroy IM, van Ijcken WF, Sleijfer S, Foekens JA, Dorssers LC. CITED2 and NCOR2 in anti-oestrogen resistance and progression of breast cancer. Br J Cancer. 2009 Dec 1;101(11):1824-32

Yanagie H, Hisa T, Ogata A, Miyazaki A, Nonaka Y, Nishihira T, Osada I, Sairennji T, Sugiyama H, Furuya Y, Kidani Y, Takamoto S, Takahashi H, Eriguchi M. Improvement of sensitivity to platinum compound with siRNA knockdown of upregulated genes in platinum complex-resistant ovarian cancer cells in vitro. Biomed Pharmacother. 2009 Sep;63(8):553-60

Combes AN, Spiller CM, Harley VR, Sinclair AH, Dunwoodie SL, Wilhelm D, Koopman P. Gonadal defects in Cited2-mutant mice indicate a role for SF1 in both testis and ovary differentiation. Int J Dev Biol. 2010;54(4):683-9

Lau WM, Weber KL, Doucet M, Chou YT, Brady K, Kowalski J, Tsai HL, Yang J, Kominsky SL. Identification of prospective factors promoting osteotropism in breast cancer: a potential role for CITED2. Int J Cancer. 2010 Feb 15;126(4):876-84

This article should be referenced as such:

Haase M, Willenberg HS. CITED2 (Cbp/p300-interacting transactivator, with Glu/Asp-rich carboxy-terminal domain, 2). Atlas Genet Cytogenet Oncol Haematol. 2010; 14(10):937-941.