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Distinct and overlapping roles of ARID3A and ARID3B in regulating E2F-dependent transcription via direct binding to E2F target genes (Article)

(Open Access)

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Abstract

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The AT-rich interacting domain (ARID) family of DNA.binding proteins is involved in various biological processes, including the regulation of gene expression during cell proliferation, differentiation and development. ARID3A and ARID3B are involved in chromatin remodeling and can bind to E2F1 and retinoblastoma tumor suppressor protein (RB), respectively. However, their role in regulating E2F target gene expression remains poorly understood. E2F transcription factors are critical regulators of cell cycle progression and are modulated by RB. Herein, putative ARID3.binding sites (BSs) in E2F target genes were identified, including Cdc2, cyclin E1 and p107, and it was found that ARID3A and ARID3B bound to these BSs in living cells. The mutation of ARID3 BSs reduced Cdc2 promoter activity, while ARID3A and ARID3B overexpression increased the promoter activity, depending on both ARID3 and E2F BSs. ARID3B knockdown blocked the transcription of Cdc2, cyclin E1 and p107 in normal human dermal fibroblasts (NHDFs), whereas the effects of ARID3A knockdown varied depending on the target genes. ARID3B overexpression, but not that of ARID3A , upregulated the transcription of E2F target genes, and activated cyclin E1 transcription and induced cell death with E2F1 assistance. Finally, ARID3A and ARID3B knockdown attenuated the cell cycle progression of NHDFs and T98G cells, and suppressed tumor cell growth. On the whole, these results indicate that ARID3A and ARID3B play distinct and overlapping roles in E2F.dependent transcription by directly binding to the E2F target genes. The present study provides novel insight into the mechanisms underlying the E2F dysregulation caused by ARID3A and ARID3B overexpression, which may have a significant influence on the progression of tumorigenesis.

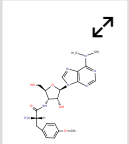
SciVal Topic Prominence

Topic: Single Stranded DNA Binding Protein | B-Lymphocyte Subset | Trophoblasts

Prominence percentile: 44.736

Chemistry database information

Substances



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ARID3A | ARID3B | AT-rich interacting domain | Cell proliferation | E2F | E2F target genes | Transcriptional regulation | Tumorigenesis

Indexed keywords

EMTREE drug terms: ARID3A protein | ARID3B protein | caspase 3 | caspase 7 | complementary DNA | cyclin dependent kinase 1 | DNA binding protein | protein p107 | protein p27 | protein p53 | short hairpin RNA | small interfering RNA | transcription factor E2F | unclassified drug

EMTREE medical terms: amino acid sequence | apoptosis | Article | binding site | carcinogenesis | Cdc2 gene | cell aging | cell cycle progression | cell proliferation | controlled study | cyclin E1 gene | disease association | DNA cross linking | DNA sequencing | DNA synthesis | enzyme activity | gene | gene expression | genetic transcription | glioblastoma | human | human cell | in vitro study | mRNA expression level | newborn | p107 gene | priority journal | promoter region | protein DNA binding | protein expression | protein function | skin fibroblast | T98G cell line | transactivation | transcription initiation | transcription initiation site | transcription regulation | upregulation

Chemicals and CAS Registry Numbers:

caspase 3, 169592-56-7; caspase 7, 189258-14-8; protein p107, 150549-31-8

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