ANG cleaves tRNA to yield tRNA halves

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03/05/2024

Introduction

Reactome is open-source, open access, manually curated and peer-reviewed pathway database. Pathway annotations are authored by expert biologists, in collaboration with Reactome editorial staff and cross-referenced to many bioinformatics databases. A system of evidence tracking ensures that all assertions are backed up by the primary literature. Reactome is used by clinicians, geneticists, genomics researchers, and molecular biologists to interpret the results of high-throughput experimental studies, by bioinformaticians seeking to develop novel algorithms for mining knowledge from genomic studies, and by systems biologists building predictive models of normal and disease variant pathways.

The development of Reactome is supported by grants from the US National Institutes of Health (P41 HG003751), University of Toronto (CFREF Medicine by Design), European Union (EU STRP, EMI-CD), and the European Molecular Biology Laboratory (EBI Industry program).

Literature references

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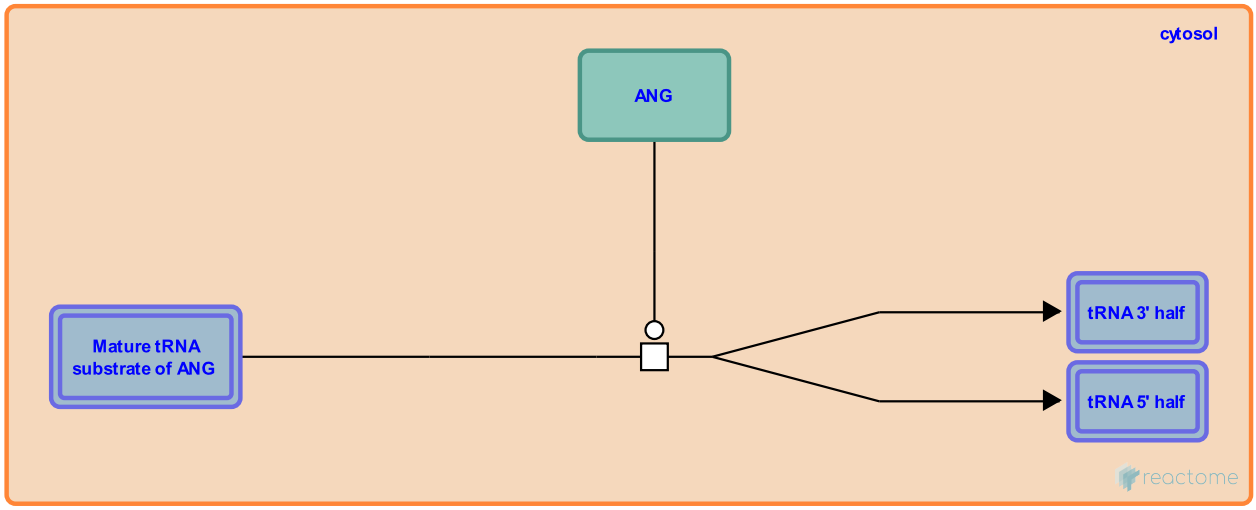
Stable identifier: R-HSA-9708327

Type: transition

Compartments: cytosol



Angiogenin (ANG) cleaves within or near the anticodon of specific tRNAs including but not limited to: tRNA Arg ACG (Fu et al. 2009), tRNA Arg CCG (Fu et al. 2009), tRNA Glu CTC (Fu et al. 2009), tRNA Gly CCC (Fu et al. 2009), tRNA Gly GCC (Fu et al. 2009), tRNA Met CAT (Fu et al. 2009, Su et al. 2019), tRNA Pro AGG (Yamasaki et al. 2009), tRNA Pro TGG (Yamasaki et al. 2009), tRNA Val AAC (Fu et al. 2009), tRNA Ala AGC (Su et al. 2019), tRNA Ala CGC (Su et al. 2019), tRNA Ala TGC (Su et al. 2019), tRNA Asp GTC (Su et al. 2019), tRNA Glu TTC (Su et al. 2019), tRNA His GTG (Su et al. 2019), tRNA Leu CAG (Su et al. 2019), tRNA Leu TAG (Su et al. 2019), tRNA Lys TTT (Su et al. 2019), tRNA Ser GCT (Su et al. 2019), tRNA Ser CGA (Su et al. 2019), tRNA Val CAC (Su et al. 2019), tRNA Val TAC (Su et al. 2019) (also Lee and Vallee 1989, Saxena et al. 1992, Emara et al. 2010, Ivanov et al. 2011). The products are a 5' fragment of about 30-35 nt and a 3' fragment of about 40 nt known as tRNA halves or stress-induced tRNA fragments (tiRNAs) (Emara et al. 2010). As a result of ANG cleavage, the 5' tRNA halves contain 5' monophosphates (Emara et al. 2010) and 3' cyclic monophosphates (Shigematsu et al. 2018), while the 3' tRNA halves contain 5' hydroxyl groups (Shigematsu et al., 2018). ANG cleaves tRNA in response to biological conditions such as exposure to sex hormones and stresses such as starvation, oxidative stress, and virus infection (Fu et al. 2009, Emara et al. 2010, Ivanov et al. 2011, Wang et al. 2013, Honda et al. 2015, Selitsky et al. 2015), but several tRNA halves are still produced after stress in ANG knockout cells (Su et al. 2020). The 5' tiRNAs inhibit translation by displacing eIF4F from the m(7)G caps of mRNAs (Emara et al. 2010, Ivanov et al. 2011). The 3' tiRNAs protect cells against stress-induced apoptosis by interacting with cytochrome C (inferred from mouse homologs in Saikia et al, 2014). The products of ANG have modifications present on mature tRNAs (Drino et al. 2020); therefore, the cleavage is believed to occur in the cytosol (Yamasaki et al. 2009, reviewed in Lyons et al. 2018) perhaps as ANG is translocated from receptors on the plasma membrane through the cytosol to the nucleus.

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Editions

2020-11-27	Authored, Edited	May, B.
2021-02-13	Reviewed	Basso, K.
2021-02-20	Reviewed	Dutta, A., Wilson, B., Su, Z.