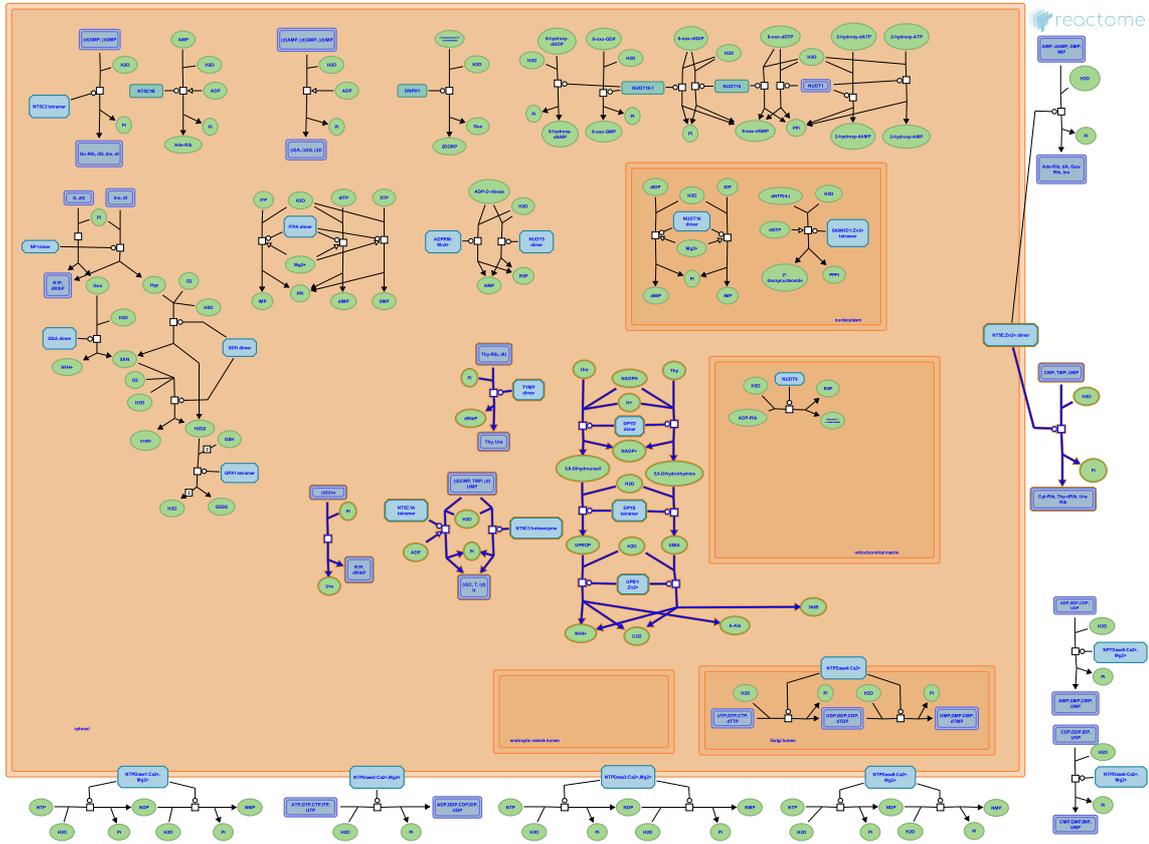


Pyrimidine catabolism



European Bioinformatics Institute, New York University Langone Medical Center, Ontario Institute for Cancer Research, Oregon Health and Science University.

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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.

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Literature references

- Fabregat, A., Sidiropoulos, K., Viteri, G., Forner, O., Marin-Garcia, P., Arnau, V. et al. (2017). Reactome pathway analysis: a high-performance in-memory approach. *BMC bioinformatics*, 18, 142. [↗](#)
- Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics*, 33, 3461-3467. [↗](#)
- Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res*, 46, D649-D655. [↗](#)
- Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology*, 14, e1005968. [↗](#)

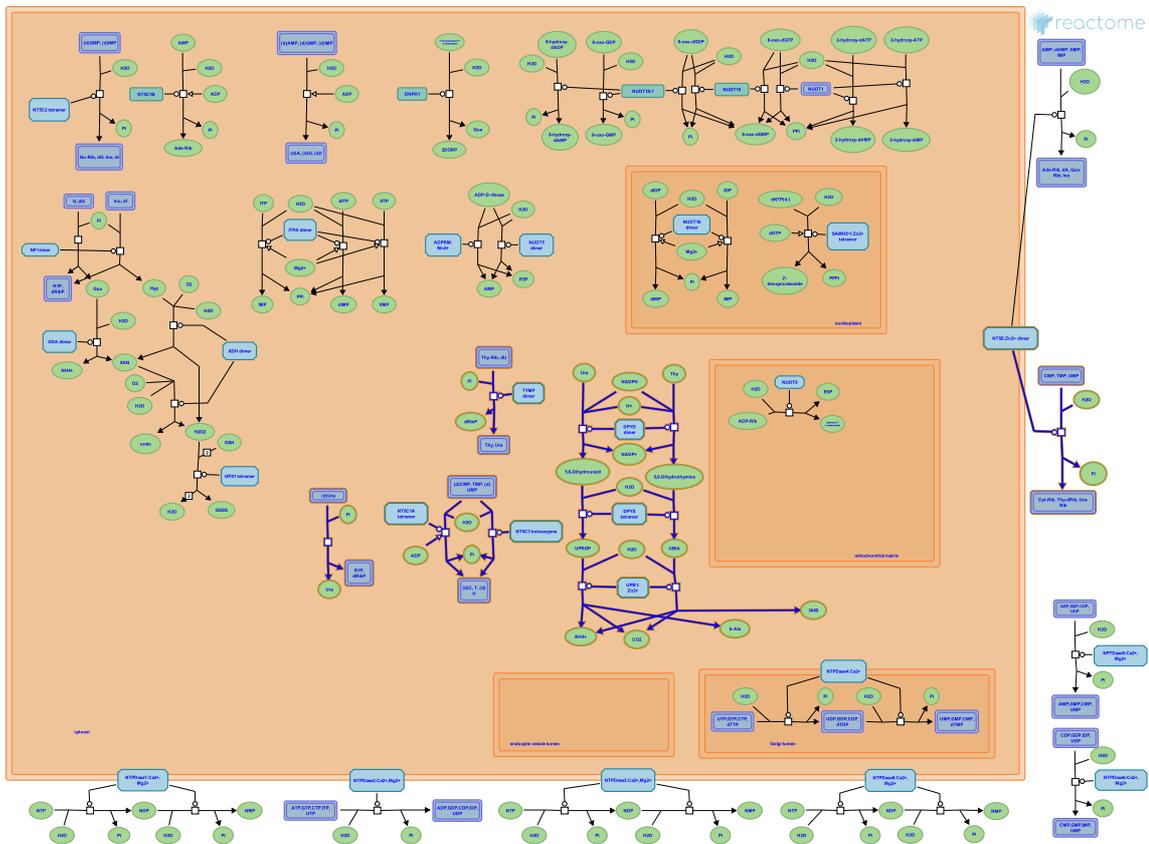
Reactome database release: 69

This document contains 1 pathway and 11 reactions ([see Table of Contents](#))

Pyrimidine catabolism ↗

Stable identifier: R-DRE-73621

Inferred from: Pyrimidine catabolism (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

CMP or TMP or UMP + H₂O => cytidine, thymidine, or uridine + orthophosphate
[NT5E] ↗

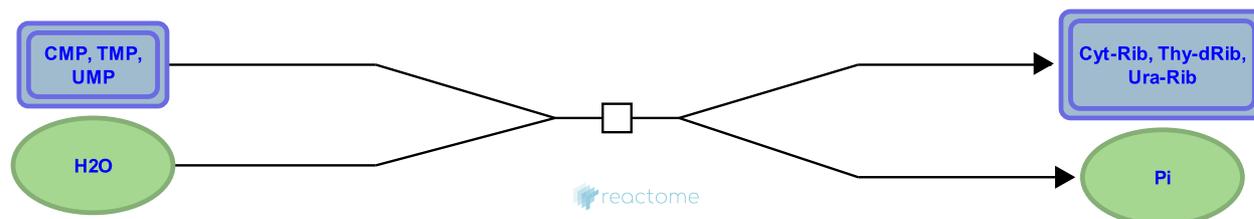
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-109291

Type: transition

Compartments: extracellular region, plasma membrane

Inferred from: [CMP or TMP or UMP + H₂O => cytidine, thymidine, or uridine + orthophosphate \[NT5E\]](#)
(Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

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(d)CMP, TMP, or (d)UMP + H₂O => (deoxy)cytidine, thymidine, or (deoxy)uridine + orthophosphate (NT5C3) ↗

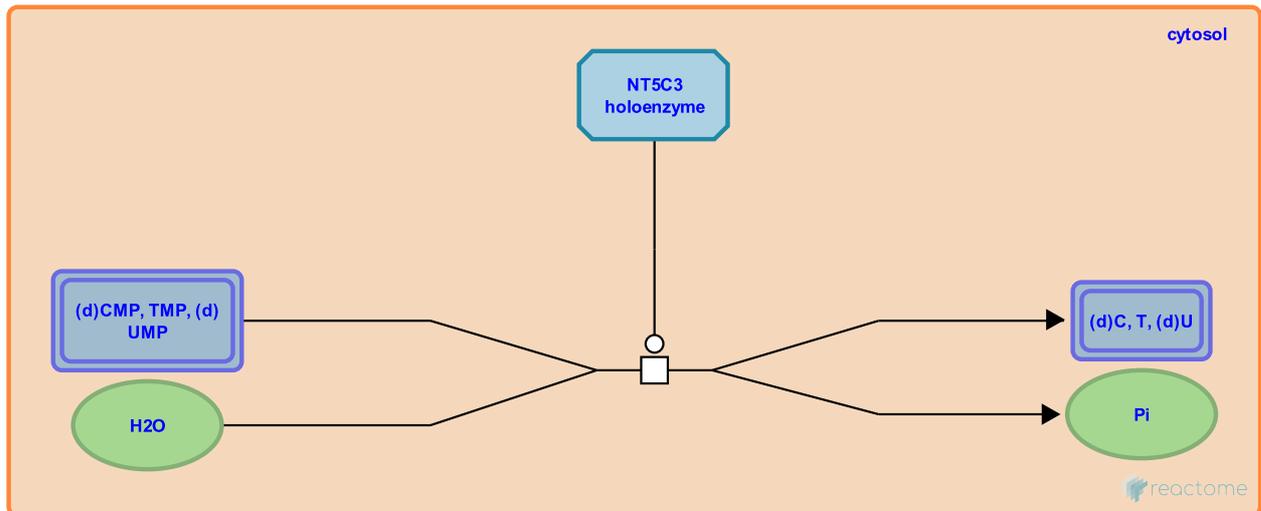
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-109449

Type: transition

Compartments: cytosol

Inferred from: [\(d\)CMP, TMP, or \(d\)UMP + H₂O => \(deoxy\)cytidine, thymidine, or \(deoxy\)uridine + orthophosphate \(NT5C3\) \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

(d)CMP, TMP, or (d)UMP + H₂O => (deoxy)cytidine, thymidine, or (deoxy)uridine + orthophosphate (NT5C1A) ↗

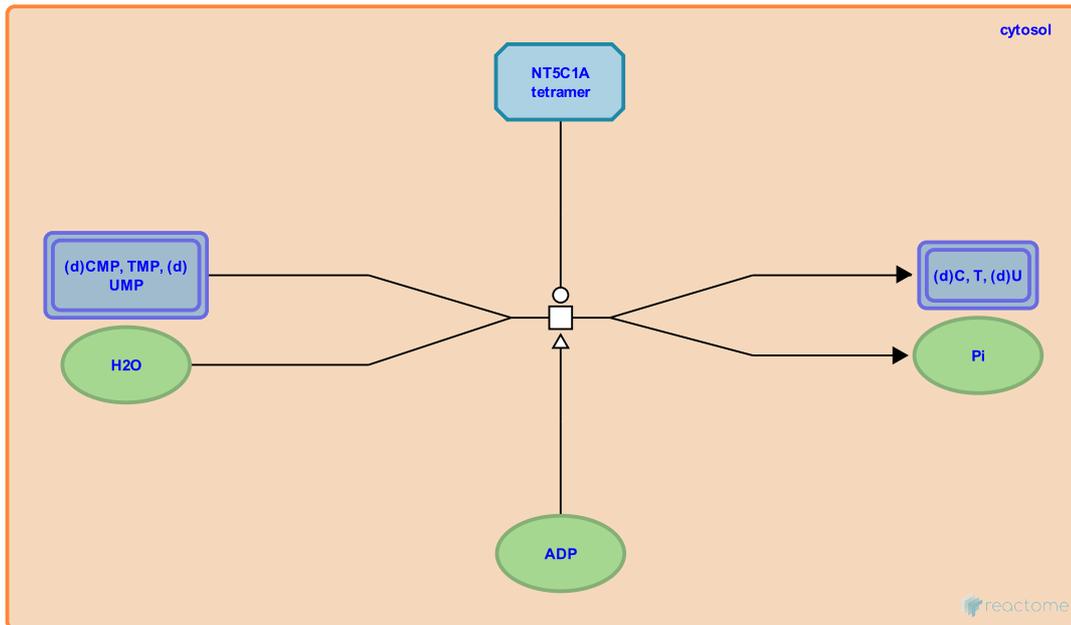
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-109380

Type: transition

Compartments: cytosol

Inferred from: [\(d\)CMP, TMP, or \(d\)UMP + H₂O => \(deoxy\)cytidine, thymidine, or \(deoxy\)uridine + orthophosphate \(NT5C1A\) \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

(deoxy)uridine + orthophosphate <=> uracil + (deoxy)ribose 1-phosphate (UPP) ↗

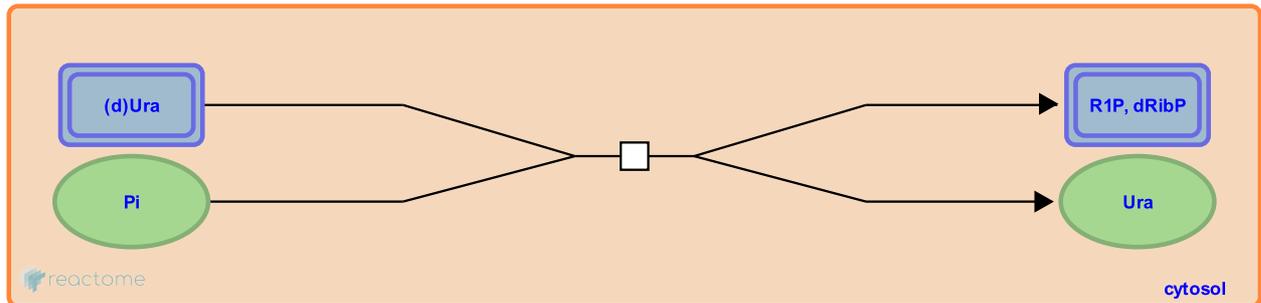
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-74376

Type: transition

Compartments: cytosol

Inferred from: [\(deoxy\)uridine + orthophosphate <=> uracil + \(deoxy\)ribose 1-phosphate \(UPP\) \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

thymidine or deoxyuridine + orthophosphate <=> thymine or uracil + 2-deoxy-D-ribose 1-phosphate [TYMP] ↗

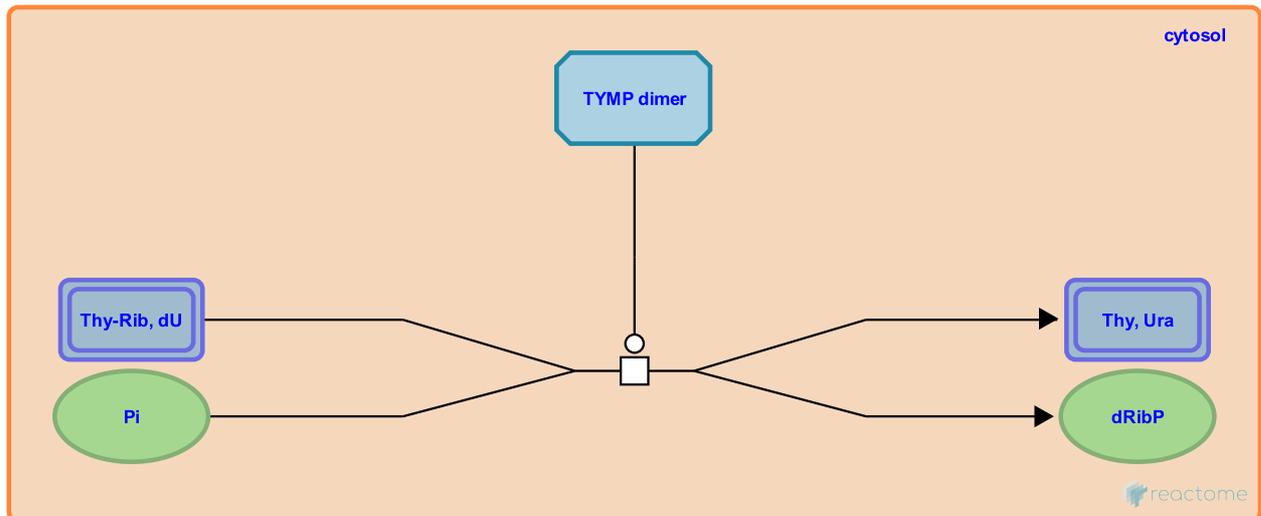
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-112265

Type: transition

Compartments: cytosol

Inferred from: [thymidine or deoxyuridine + orthophosphate <=> thymine or uracil + 2-deoxy-D-ribose 1-phosphate \[TYMP\]](#) (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

uracil + NADPH + H+ => 5,6-dihydrouracil + NADP+ ↗

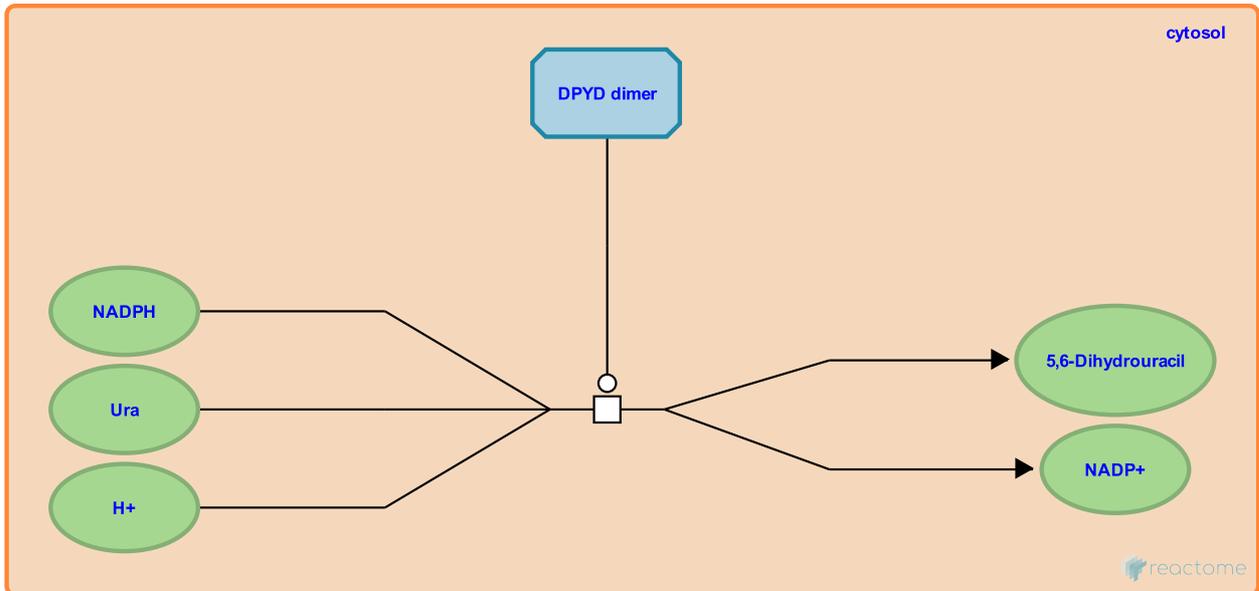
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73585

Type: transition

Compartments: cytosol

Inferred from: [uracil + NADPH + H+ => 5,6-dihydrouracil + NADP+ \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: [5,6-dihydrouracil + H2O => beta-ureidopropionate](#)

5,6-dihydrouracil + H₂O => beta-ureidopropionate ↗

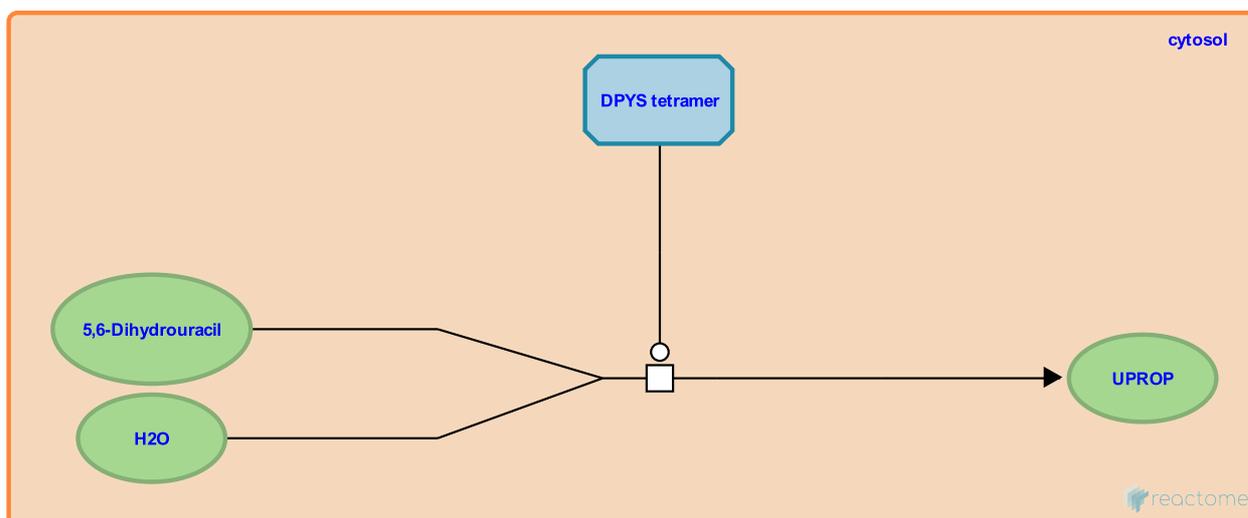
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73589

Type: transition

Compartments: cytosol

Inferred from: [5,6-dihydrouracil + H₂O => beta-ureidopropionate \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [uracil + NADPH + H⁺ => 5,6-dihydrouracil + NADP⁺](#)

Followed by: [beta-ureidopropionate + H₂O => beta-alanine + NH₄⁺ + CO₂](#)

beta-ureidopropionate + H2O => beta-alanine + NH4+ + CO2 ↗

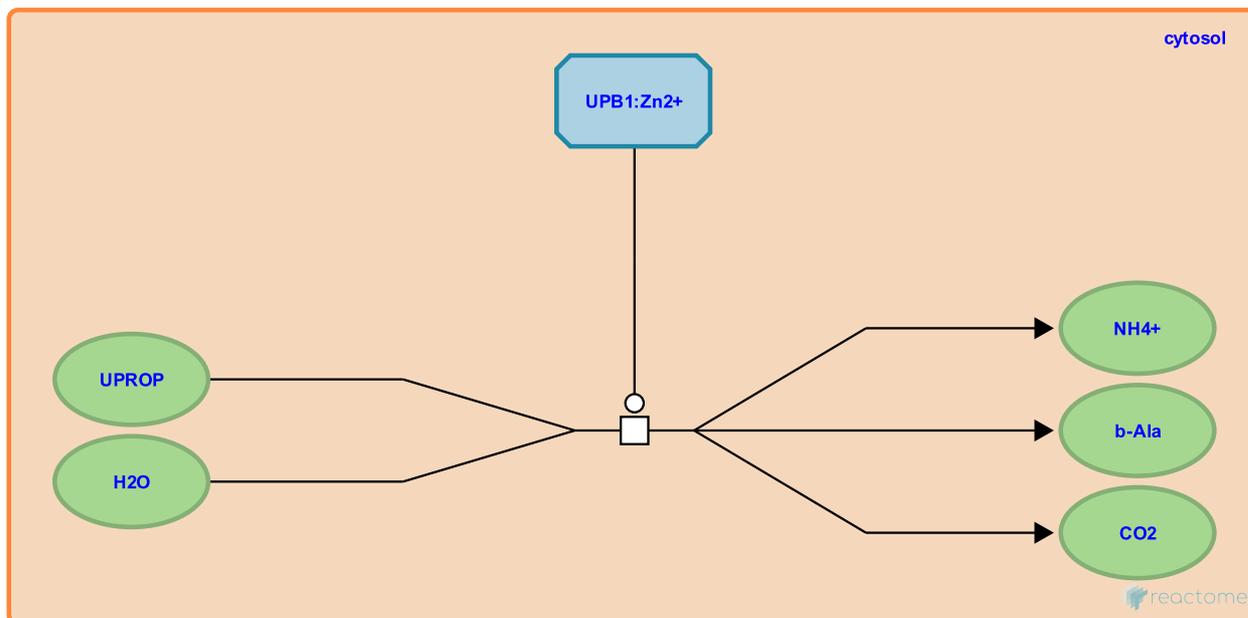
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73591

Type: transition

Compartments: cytosol

Inferred from: [beta-ureidopropionate + H2O => beta-alanine + NH4+ + CO2 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [5,6-dihydrouracil + H2O => beta-ureidopropionate](#)

thymine + NADPH + H+ => 5,6-dihydrothymine + NADP+ ↗

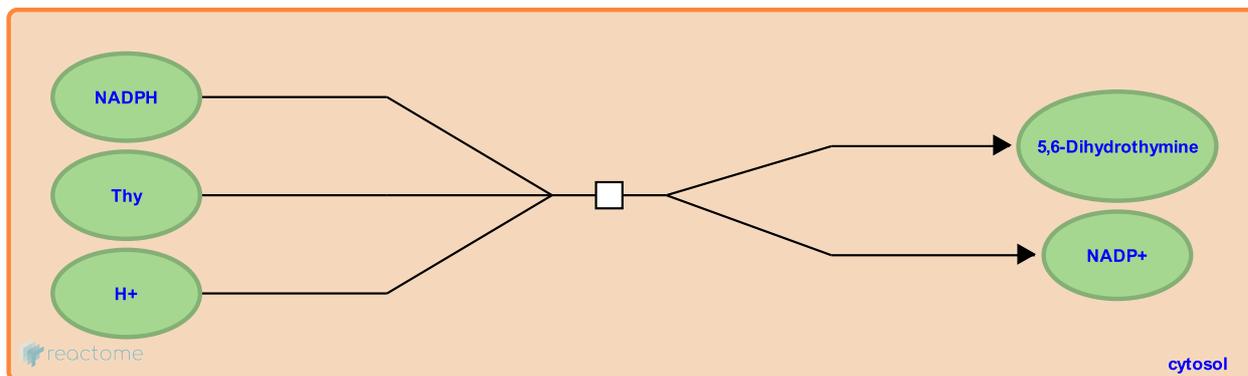
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73616

Type: transition

Compartments: cytosol

Inferred from: [thymine + NADPH + H+ => 5,6-dihydrothymine + NADP+ \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: [5,6-dihydrothymine + H2O => beta-ureidoisobutyrate](#)

5,6-dihydrothymine + H2O => beta-ureidoisobutyrate ↗

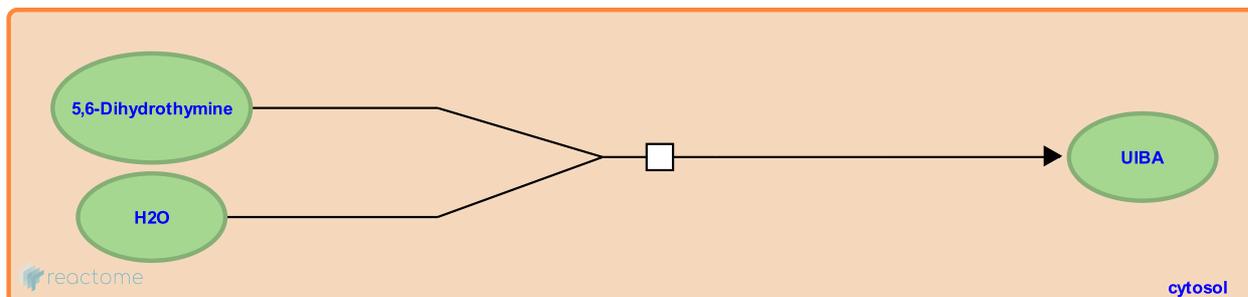
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73618

Type: transition

Compartments: cytosol

Inferred from: [5,6-dihydrothymine + H2O => beta-ureidoisobutyrate \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [thymine + NADPH + H+ => 5,6-dihydrothymine + NADP+](#)

Followed by: [beta-ureidoisobutyrate + H2O => 3-aminoisobutyrate + NH4+ + CO2](#)

beta-ureidoisobutyrate + H2O => 3-aminoisobutyrate + NH4+ + CO2 ↗

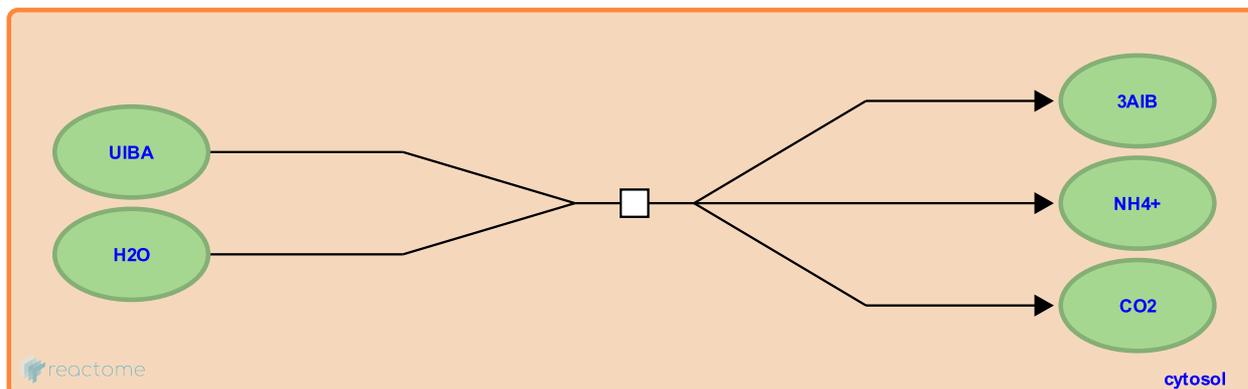
Location: [Pyrimidine catabolism](#)

Stable identifier: R-DRE-73620

Type: transition

Compartments: cytosol

Inferred from: [beta-ureidoisobutyrate + H2O => 3-aminoisobutyrate + NH4+ + CO2 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](/electronic_inference_compara.html) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [5,6-dihydrothymine + H2O => beta-ureidoisobutyrate](#)

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