Digestion of branched starch (amylo-pectin) by extracellular amylase

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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

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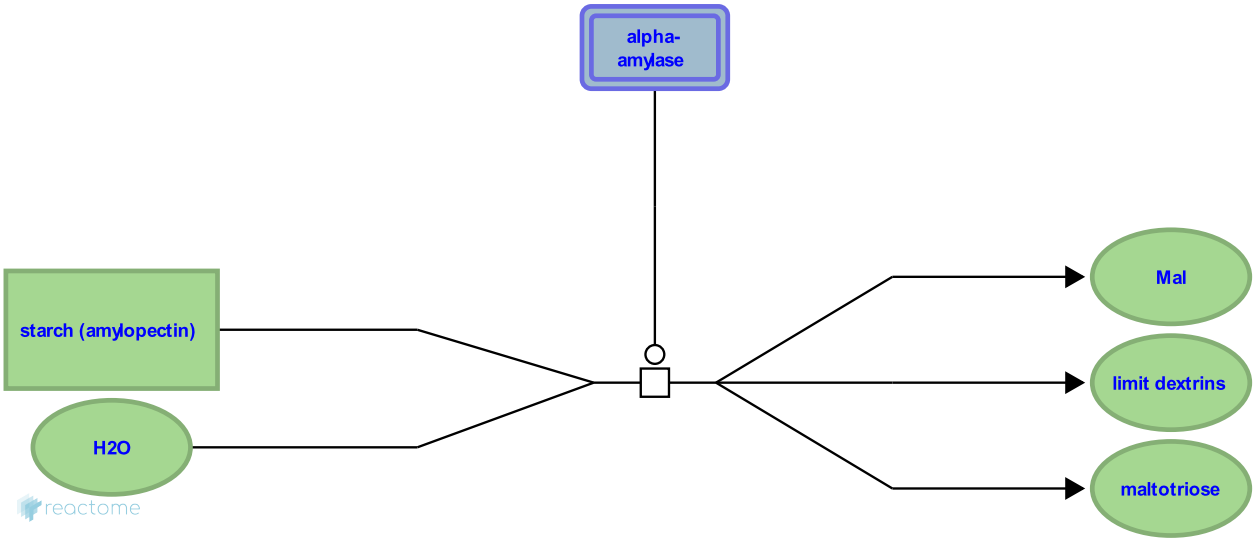
Stable identifier: R-HSA-191114

Type: transition

Compartments: extracellular region



The 1-4 linkages of extracellular amylopectin starch, a glucose polymer containing linear segments formed by alpha-1,4 linkages and a smaller number of alpha-1,6 linkages forming branch points, are digested by the endoglucosidase activity of alpha-amylases, yielding maltose, maltotriose, and longer maltosides from the alpha-1,4 linear segments and alpha-limit dextrins from the branch points. Alpha-limit dextrins are glucose (G) oligomers linked by 1-4 and 1-6 bonds. 1-6 branch points make up about 5% of all amylopectin glucose bonds - the exact fraction depends on the source of the starch. Mass spectroscopic analysis of alpha-limit dextrin shows it to be a mixture of maltosides and isomaltosides containing two to forty G residues, but the most common contain fewer than seven. Maltose (G2) is the shortest 1-4 maltoside produced by alpha-amylase. Isomaltose (G2) is the shortest 1-6 isomaltoside.

The human genome contains five functional alpha-amylase genes, encoding structurally closely related isoenzymes (Gumucio et al. 1988). Three of these genes encode proteins synthesized in the parotid glands and released into the saliva (amylase 1A, B, and C), and the other two encode proteins synthesized in the exocrine pancreas and released into the small intestine (amylase 2A and B). In the human body, starch digestion thus commences in the mouth, mediated by salivary amylases, and is continued in the small intestine, mediated by the pancreatic ones.

X-ray crystallographic studies of amylase 1A and 2A proteins show them to be monomers, complexed with single calcium and chloride ions (Ramasubbu et al. 1996; Brayer et al. 2000). Biochemical characterization of amylase 2A indicates that the enzyme efficiently cleaves poly-glucose chains so as to release maltose - a glucose disaccharide - from the reducing end of the chain (Braun et al. 1993; Brayer et al. 2000).

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Editions

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