

Digesting Starch

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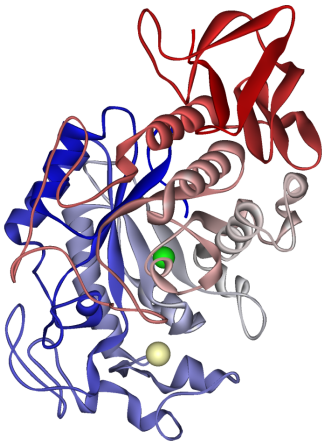
Starch



- ▶ Starch is a chain of glucose molecules.
- ▶ Most plants store energy as starch.
- ▶ Found in seeds, tubers, and storage organs.
- ▶ Most common carbohydrate in human diet.

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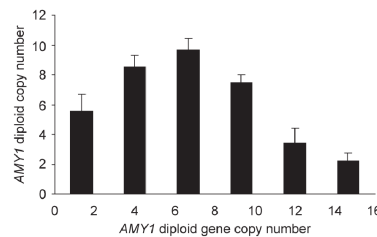
Amylase: enzyme that digests starch



- ▶ Turns starch into sugar (glucose).
- ▶ Pancreatic amylase: in stomach
- ▶ Salivary amylase: in mouth
- ▶ Perry et al (2007) studied AMY1, the gene that encodes human salivary amylase.

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Multiple copies of AMY1 in humans



- ▶ Some humans have more copies of AMY1 than others.
- ▶ Chimps only have 2.
- ▶ Average human has $\sim 3\times$ salivary amylase of average chimp. Bonobos may not have any.
- ▶ Why?

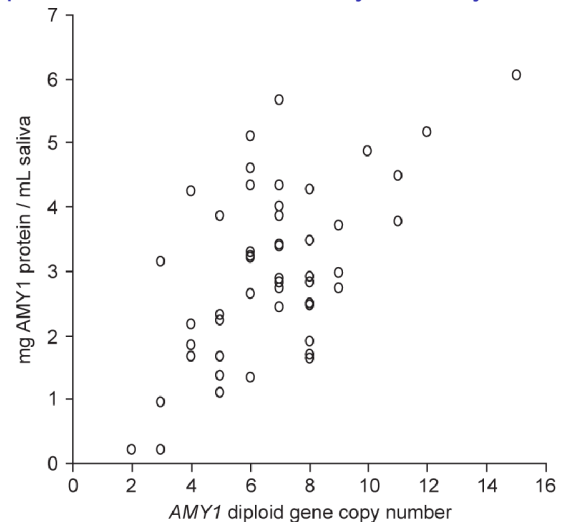
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How the Neolithic changed human diets

- ▶ Farmers eat a lot of starch and need a lot of amylase.
- ▶ Herders and some foragers eat less starch, need less amylase.
- ▶ Perhaps multiple copies of AMY1 help farmers digest starch.

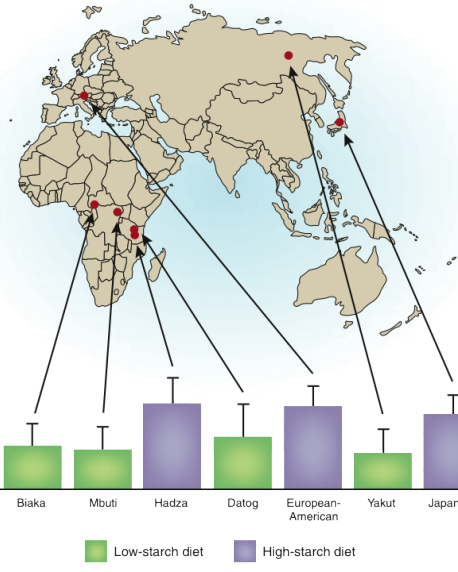
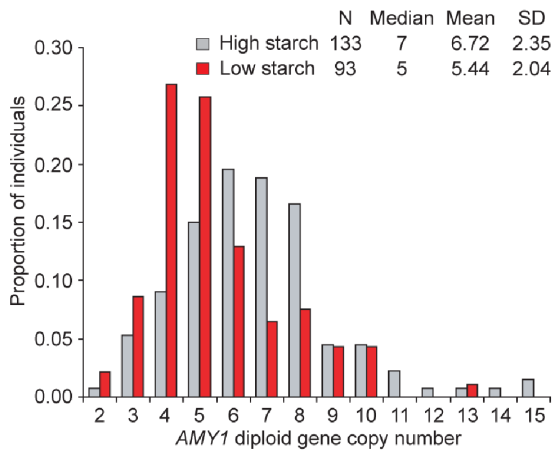
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More copies of AMY1 \Rightarrow more amylase enzyme.



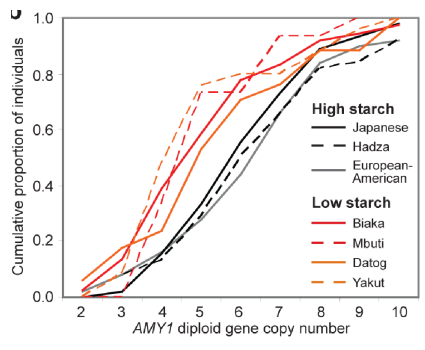
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Pops w/ high-starch diets have more copies of AMY1



Population diffs
High-starch diet
⇒ more copies
of AMY1

Amylase population differences



Same data: slide from original publication.
Populations that eat starch have more copies of AMY1.

Amylase copy-number evolution in other species

There has also been a copy-number increase in the amylase genes of dogs (Axelsson et al., 2013), house mice (Schibler et al., 1982), and pigs—all of which eat human food.