

Effect of different tastes on activity of salivary amylase



Medical Science

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ABSTRACT

The salivary amylase acts on starch in oral cavity converting it into simple sugars. Various studies on the effect of several parameters on the rate of salivary amylase are reported in the literature. The present study is very new approach towards the amylase activity where several items having different tastes were consumed and the saliva was collected after five minutes to see its reaction with starch. The results showed that there was no difference in the reaction rate after consuming sweet and umami. Bitter and hot water showed increased rate of amylase activity. Cold water, salty and sour flavors reduced the rate of salivary amylase significantly. A combination of different stimulants in the form of tomato soup was seen which has shown fall in the activity.

Introduction

Amylase is an enzyme that brings about the hydrolysis of starch and carbohydrates. There are three types of amylases namely α , β and γ . β and γ are not found in animal tissue. α amylase is secreted by salivary gland and pancreas that hydrolyze polysaccharides into useful monomers. Salivary amylase works in oral cavity. When the chyme passes down through stomach, due to high acidic pH, the salivary amylase is denatured. The activity of hydrolyzation of polysaccharides is again continued in small intestine with the secretion of pancreatic amylase.

The activity of salivary amylase is altered by various components. Several studies indicate the inhibition of salivary amylase activity by various things like *Phyllanthus spp.* (Ali *et al.* 2006), betel leaf and its quid components (Gokhale 2011), polypeptide and oil isolated from *Momordica charantia* (Ahmad *et al.* 2012).

Many studies focus on the use of amylase inhibitors for the cure of diabetes. The insufficient insulin production causes the blood sugar level to increase. In such cases if the starch is not converted to sugar, then, though the insulin is insufficient, it will help in keeping the blood sugar under control.

The present study is a small pilot study to see the effect of several tastes on amylase activity.

Experimental

To conduct the present study, healthy volunteers were selected as subjects who were not on medication and also do not have any addiction. Five tastes stimulants were chosen namely salty, sweet, sour, bitter and umami. The hot and cold stimuli were also included to see their effect on the salivary amylase. Tomato soup was also taken as it is one of the appetizers which is the mix of salt, sour, sweet and hot.

The subjects were asked to rinse their mouth and collect their saliva in clean vials. It was used as control. Then they were asked to consume each of the taste stimulants separately and their saliva was collected after five minutes in clean vials. This was used as a test sample. On a day only single taste was done.

The saliva collected was diluted five times by using distilled water and centrifuged to separate particles if any. The effect of salivary amylase was then seen on 1 % starch using Lugol's iodine as an indicator by Cavity tile method at pH 6.7 and temperature 37°C. The time for breakdown of starch was noted carefully by repeating experiment till the results were reproducible.

Results and discussion

Hot water as well as bitter gourd (used as a bitter taste stimulant) consumption has shown rise in the amylase activity by 65% and 60 % respectively. Sweet (introduced by sugar) and umami (introduced by monosodium glutamate) taste stimulation has no effect on amylase activity. Saliva collected after consumption of cold water showed 80% fall in the amylase activity. Salt taste showed 242% fall in the amylase activity whereas lemon inhibited amylase activity by 550%. The soup which was mixture of the few of these tastes 64% fall in the activity.

Effect of different conditions like temperature and pH are tested in vitro several times by other researchers and it is known fact that the increase in temperature increases the rate of reaction and hence the enzyme activity where as lower temperature decreases the rate. During the present study, the consumption of hot and cold water might have altered the temperature of oral cavity and hence saliva. However, when the experiment was conducted, the temperature of the test set was maintained at 37°C.

The saliva obtained after consumption of bitter gourd to give bitter taste has shown rise in the activity of salivary amylase. However, previous in-vitro study of treatment of bitter gourd leaves on salivary amylase (Gines *et al.* 2013) shows that there is inhibition of salivary amylase activity in its in vitro studies. The fruits of *Momordica charantia* (bitter gourd) have also shown the reduction in blood sugar level, (Leatherdale *et al.* 1981).

Increasing salt concentration has shown fall in the amylase activity (Datta *et al.* 2006) when reaction mixture of amylase and glucose were treated with varied concentrations of salts. This observation is in accordance to the present study.

The saliva collected after eating sugar shows no effect on amylase activity. The effect of sucrose on amylase of peanuts shows that there is very little loss of enzymatic activity (Davis 1983).

The fall in enzymatic activity after lemon consumption is in accordance to the in vitro studies of *Citrus macroptera* indicating its inhibitory effect on salivary amylase of rats (Uddin *et al.* 2014). The increased pH may be the reason to drop the reaction rate.

There was no literature found on umami taste and amylase activity. However, the study indicates (Hodson and Linden, 2006) that umami (monosodium glutamate) increases the salivary flow. Present study showed no effect on the activity of salivary amylase.

Conclusion

The study was preliminary but significant. Since, various taste stimulants have shown variation in amylase activity, this phenomenon can be used as one of the remedial measure either to enhance or inhibit the activity of salivary amylase as per the need of the patient. The perfect combination of the ingredients may be boon to the diabetic patients who need to reduce the digestion of the starch so as to produce less glucose. Further, research is needed in this field.

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