

Effects of activities of fluorides and salivary amylase



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Ever since 1919, effects of activities of fluorides and salivary amylase have been reported. Nonetheless, research on effects of salivary amylase and fluorides activities are limited. Investigation carried out by several researchers on salivary amylase about splitting properties of starch to dental caries development showed mixed results. While other studies implied a correlation between dental caries and high activities of salivary amylase, some research on the same topic showed negative correlation. At the same time, other studies showed no correlation at all (Vergona, 1993).

Salivary amylase aids in metabolism and colonization of streptococcus that lead to dental plaque and dental caries formation. It acts as a receptor on which microorganism sticks to tooth surfaces. Moreover it has capabilities of binding to surfaces of bacteria and hydrolyses starch to produce products that are altered to form acids. In in vivo and in vitro studies, it is indicated that sodium fluoride inhibits salivary amylase enzyme when the concentration of fluoride is more than 5×10^{-2} M (BioSciences Information Service of Biological Abstracts, 1978). This means that salivary amylase of human being is not impinged on when fluoride concentration is below 5×10^{-2} M. In vivo study showed that when a rat drinks water that has 25 or 50 ppm of fluorides for a period of four weeks, there is stimulation of salivary amylase secretion and flow rate in parotid glands (Afonsky, 1961).

Influence of human salivary glands by fluoride is done by use of sodium fluoride solution (NaF) in in vitro experiment. In this experiment, participants are allowed to fast overnight and wash their mouth with water that is distilled before chewing parafilm at around 9 a. m. Saliva is then produced within the next two minutes after water rinsing for a period of ten minutes

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and centrifuged at 12500 x g in a centrifuge known as Sorvall RC2-B. At this point the saliva pH level is measured (Kettering Laboratory, 1963).

The data produced from preliminary analysis of this study do not show any important difference between sexes on activities of salivary amylase.

Varying the concentration of NaF ranging (sodium fluoride) between 0 and 500 mM do not cause major differences in activities of salivary amylase.

When NaF concentration is at 100 mM, the activity of salivary amylase is more than 100%. But when the concentration of NaF is at 500mM, the activity of salivary amylase becomes 92.8%. Because of intraoral activity of salivary amylase, it is considered as very important for oral health. Salivary gland produces this enzyme and is found at a low concentration in parotid gland. It is protein in nature and in molecular terms, it has a 62-67 kDa weight. Amylase enzyme digests polysaccharides through hydrolysis of glycogen, 4 glucosidic starch linkages and other polysaccharides (Rajesndran, 2009).

An assay enzyme is made by a mixture that has 3ml of 0.2% of solution of starch, 3% of 0.1M solution of Tris buffer which has a pH of 7.0 and 0.1M solution of saliva extract that is diluted. The assay mixture is warmed at a temperature of 37 degrees Celsius for a period of one hour. Towards the end period of experiment, aliquot solution having 1.0 M is pipetted in a test tube that has a 1.0 N solution of Nelson_Somogyi. This mixture is then heated in hot water for a period not less than ten minutes. 1.0M solution of NaF solution is added to this mixture after cooling down. The resultant solution is suitably diluted and read in a spectrophotometer on 520nm mark.

In a latest research, it was shown that a decoction of tea that has high fluoride concentration exhibits no amylase inhibition. Moreover, no enzyme activity is observed on addition of more concentration of NaF (Seifert, 1986). Ph variation of incubation medium caused the NaF inhibition effect. In this experiment, after incubation period of one hour, it is impossible to sense variations that are more than 0.01 ph unit. Making a comparison between the joint results gained from the experiment with water and the one that was gotten from rinsing with a solution of 0.05% NaF shows that the difference becomes significantly significant. There is a possibility that huge individual variation gotten from every group is likely to influence analysis.

The final results gotten for activity of amylase in in vivo experiment were succumbed to test of Kolmogorov-Smirnov ($p < 0.05$). They yielded the figures $d = 0.06868$ and $p = ns$ implying that this information fits normal distribution curve (Shils & Shike, 2006). Despite the fact that the mean values found for activity of human salivary amylase after rinsing with a solution of 0.05% NaF were more than the ones found by rinsing with water that is distilled, the ANOVA analysis shows that the differences were not statistically significant. Just as other researchers found out, with the conditions in this study, whether in vivo experiment of rinsing the participant's mouth with a solution of 0.05% (11.9 mM) of NaF or in vitro experiment with equal to 500 mM solution of NaF of incubation, it is impossible to examine any observable fluoride effect on human salivary amylase activities (Yuehuei & Friedman, 2000).

Even though the alpha-amylase shows to be remarkably stable on high ph levels, it is quite possible that detected decrease in enzyme activity levels <https://assignbuster.com/effects-of-activities-of-fluorides-and-salivary-amylase/>

when it was treated with 100 mM and 500nM NaF solution respectively is caused by increase in pH by the fluoride actions. The stability and activity of human salivary amylase is relied on aluminium and sodium ions that are present. Just like disulfide linkages, aluminium specifically forms cross-links of molecules with the protein of the enzyme. A number of enzymes that need aluminium for activity are slowed down by fluoride. The mechanism used in inhibition seem to be through fluoride that induced aluminium removal as it was suggested in a previous research that used amylase which was obtained from mung bean seedlings (Thimann, 1944).

Another study that has been carried out in Mexico by Alarcon-Herrera et al indicates that spontaneous fractures of bones in adults frequently show decreased tensile strength in bones were proportionally higher at 6ppm F concentration in water than at any other concentration level of F (Tmh, 2006). However, dental fluorosis that increases with increased F concentration in water correlates with incidences of bone fractures in both adults as well as children (King & Reiss, 2001).

Conclusion

This study has shown that the effects of NaF concentration on human salivary amylase activities are shown in in vivo and in vitro experiments. In vitro experiment showed that no statistically considerable difference is observed in the activity of amylase after incubation period of one hour using a fluoride solution that is concentrated to 550mM. With in vivo experiment, the effect of 0.05% solution of sodium fluoride is examined on human salivary amylase that was gathered at different intervals after rinsing the mouth of the participants. For a second time, no statistically considerable

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difference is examined in the activity of amylase in all the examined samples.