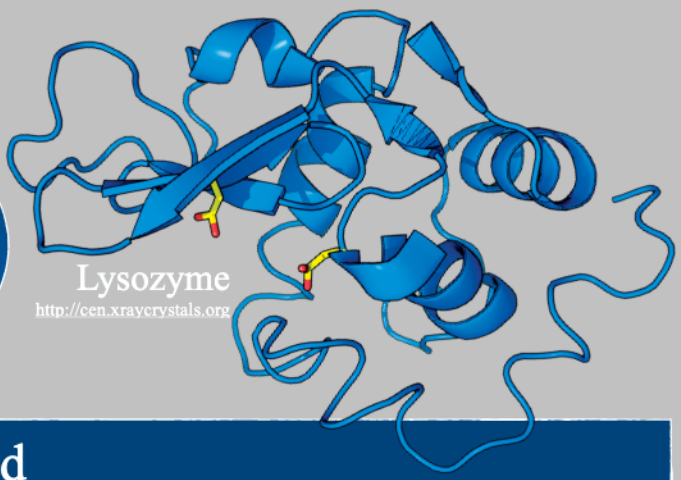
Does the lysozyme content in tears and saliva have antibacterial properties?



Background

Lysozyme is an antimicrobial enzyme whose primary structure is a simple polypeptide chain consisting of 129 amino acids. The polypeptide chain folds and the tertiary structure of lysozyme takes the form of a three-dimensional ellipse, with a large gap forming the active surface. The active surface has a very specific shape, and it is the site of the enzyme that binds the substrate.

The substrate for lysozyme is peptidoglycan, which is a polymer consisting of sugars and amino acids. Peptidoglycan is found in the cell walls of most bacteria and contributes to the supportive function of the cell wall. The structure of the peptidoglycan is built up by linear sugar chains consisting of alternating molecules of N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM). The sugar residues are linked by β- (1,4) -glycoside bonds, and with transverse oligopeptides consisting of 3-5 amino acids.

Lysozyme acts by catalyzing the cleavage of the β-(1,4) -glycoside linkages between the sugar residues N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) in peptidoglycan. As a result, the cell walls of the bacterial cells break down, and the bacterium glows as a result of its internal osmotic pressure.

Lysozyme is abundant in various secretions, and is thus part of the innate immune system. It is found in tears and saliva, among other secretions.

Purpose

The purpose of the study was to investigate whether the lysozyme content in tears and saliva has antibacterial abilities, and how well the abilities work against the bacteria that naturally occurs on human hands.

Emma Windefelt

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Handledare: Ulrika Wedding

RUDBECKS-GYMNASIET

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Method

The method used to study the protecting rate of tears, saliva and lysozyme against bacteria, consisted of bacterial cultivation on agar plates. Various combinations of M. Luteus, E-coli, hand bacteria and tears, saliva and lysozyme solution were studied. After two days of incubation in a 37 ° C heat cabinet, the bacterial growth on the agar plates was studied.

Results

Below follows three charts showing a compilation of all experiments made on the same bacterial type. On the diagrams, the y-axis represents the bacterial growth, and the x-axis describes the content of the agar plates. The bacterial growth was graded from 0-5, where 0 = no growth, 1 = small growth, 2 = fairly small growth, 3 = medium growth, 4 = fairly large growth, and 5 = large growth.

Diagram 1

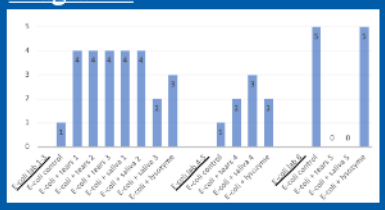

Diagram 2

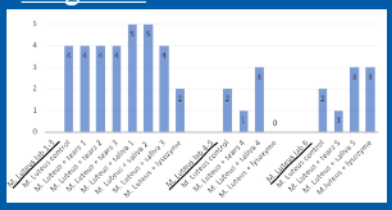

Diagram 3

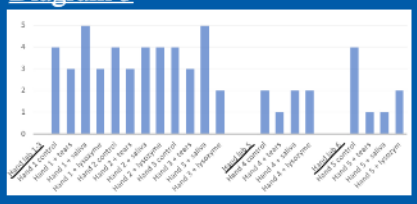

Diagram 1 shows a compilation of all cultivations with E-coli, diagram 2 shows a compilation of all cultivations with M. Luteus and diagram 3 shows a compilation of all cultivations with hand bacteria.

The conclusion of the study is that E-coli is not affected by lysozyme, according to diagram 1, and that lysozyme, to some extent, inhibits the bacterial growth of M. Luteus and hand bacteria, which is shown in diagram 2 and diagram 3.

Discussion

To draw a conclusion based on the results is difficult, as the results have a low reliability due to sources of error. For example, it is not possible to guarantee that each agar plate initially contained the same number of bacteria, and hence it is not relevant to compare the bacterial growth on different plates. The method was developed during the course of the study, and the results that come from the later laboratory sessions have higher credibility than the first results. Therefore, the conclusion was based on the results of the later experiments, but the conclusion is still not of high validity. The results are inconsistent, and since the controls did not work properly in every trial, there is not always something to go back to and compare with. In order to be able to draw a safer conclusion, the experiment must be conducted many more times, with better sterility and higher accuracy.