Effect of amine fluoride and sodium fluoride on germs of the plaque flora


Aim: In vitro-trial of the antibacterial effect of sodium fluoride and amine fluoride on bacteria in the oral flora.

Trial Conditions

Products under investigation
1. elmex® fluid (1% F⁻, deriving from Olaflur and Dectaflur)
2. Sodium fluoride solution in different concentrations

Bacteria under investigation
1. Concurrent plaque flora
2. Pure cultures of:
   - Streptococcus mutans
   - Streptococcus salivarius
   - Streptococcus sanguis
   - Lactobacillus casei

Methodology
Inhibition of bacterial acid production: taking of falling pH-curves by means of a pH-meter with writing implement.
Investigation of the bacteriostatic/bactericidal effect: determination of viable bacteria by serial dilution and plating.

Trial

1. stage
Defined quantities of plaque (wet weight: 25 mg) were each weighted and suspended in physiological sodium chloride solution. Each trial was performed with a different fluoride concentration (0, 10, 50 and 100 ppm F⁻) and with 10% saccharose each, in order to get going the bacterial metabolism. The pH-retention was measured at each stage during a period of 30 minutes. After this period the number of vital bacteria (cfu = colony forming unit) was assessed.

2. stage
According to stage 1, but with the difference that the antibacterial effect of fluoride solutions in various concentrations on defined types of bacteria were tested.
Results

Stage 1
All elmex® fluid-concentrations fully inhibited acid formation of the plaque flora from saccharose. In a concentration of 100 ppm F⁻ all bacteria of the concurrent plaque flora were killed by elmex® fluid in 30 minutes (not illustrated).

Sodium fluoride inhibited the acid formation of the plaque flora only at a concentration of 500 ppm F⁻. The viability of bacteria was not influenced by the used sodium fluoride concentration (not illustrated).

Stage 2
The antimicrobial effect of amine fluoride and sodium fluoride on the various types of bacteria is illustrated in the following. pH-difference of the initial and end results of the trial period (30 minutes) are each indicated as well as the number of viable bacteria at the end of the trial. The data confirms the results which have been obtained with mixed plaque flora (stage 1).

Figure 1a: Inhibition of acid formation of Streptococcus mutans.

Figure 1b: Influence on the viability of Streptococcus mutans.
Figure 2a: Inhibition of acid formation of Streptococcus salivarius.

Figure 2b: Influence on the viability of Streptococcus salivarius.

Figure 3a: Inhibition of acid formation of Streptococcus sanguis.

Figure 3b: Influence on the viability of Streptococcus sanguis.
1. Inhibition of acid formation

elmex® fluid has stopped bacterial acid formation at a concentration of only 10 to 100 ppm F\(^-\). In comparison, sodium fluoride only reached an equal inhibition at a concentration of 400 ppm F\(^-\).

2. Influence on the viability of bacteria

At a concentration of 100 to 400 ppm F\(^-\) elmex® fluid has a destroying effect on all tested bacteria. Sodium fluoride, however, did not influence at all the viability of the bacteria in the used concentrations.

Conclusion

In contrast to sodium fluoride, amine fluoride has a destroying effect on all types of bacteria in the oral cavity, together with a full inhibition of bacterial acid formation. This property of amine fluoride promotes the caries inhibiting effect of the fluoride ion.