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Session 1
Fluoride

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Detection Limit of Fluoride-sensitive Electrode Reconsidered by Multi-center Study

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The fluoride sensitive electrode (FSE) is widely used for fluoride quantification in solutions. Although measurements of low fluoride concentrations are known to be unreliable, these are often reported. The aim of this multi-center laboratory study was to determine the lower limit of reliable fluoride measurements in solutions using FSE methodology. Six laboratories from Germany, Switzerland and The Netherlands agreed to participate. Each group received 5 ml of 7 standard fluoride solutions (0–16 $\mu\text{mol/l}$ corresponding to 0–0.3 ppm) and 18 test solutions with fluoride content unknown to the participants, comprising 6 different concentrations. The solutions were provided and the data collected and analysed by the Pharmacological-Toxicological Service Center, Göttingen University, which institute did not participate. The solutions comprised NaF, pure water, and 1/11 part per volume TISAB III. The participants were asked to measure the fluoride content of the test solutions up to three times with the FSE. Additionally, one participant determined the fluoride content by gas chromatography. To be valid the method had to fulfil two criteria: (1) Only values higher than the blank FSE mean + 3 standard deviation of the blank were considered different from the blank. (2) An interassay-variation of <20%.

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FSE means/interassay-variation for the test solutions with 0.00 (blank), 0.30, 0.80, 1.60, 3.00, and 7.00 $\mu\text{mol/l}$ were 0.90/82, 0.64/54, 1.12/46, 1.64/20, 3.07/17, and 6.77 $\mu\text{mol/l}$ /9%. An interassay-variation of 20% or less was achieved for fluoride content higher than 1.6 $\mu\text{mol/l}$. FSE mean + 3 \times standard deviation of the blank was 3.1 $\mu\text{mol/l}$. The performance of the gas chromatography was not superior to the FSE. It is concluded that the validity of the FSE is limited to fluoride concentrations higher than 3 $\mu\text{mol/l}$ (0.06 ppm) fluoride in solution.

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Standard Fluoride Analytical Methods Development: Fluoride Analysis of Bone by Diffusion Techniques

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This study was performed as part of a larger investigation that is developing standardized methods for fluoride (F) analysis. The objective was to assess methodologies used for fluoride analyses of hard tissues using bone. Fifteen (0.4 g) samples (ashed and pulverized bone from a femur of a 40-year-old healthy male) were sent to 9 laboratories. The F content of the samples was analyzed by each laboratory and its own methodology. One laboratory assessed the effect of additional pulverization while another determined the ideal weight to be used. Methods and techniques used by each lab-