Trace Analysis of Fluoride in Earlobe Blood

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SUMMARY: A new microscale method for measuring ionic fluoride in blood of the earlobe is reported. By this method, the average recovery rate of sample is 98.76+3.93% and the coefficient of variation of sample is 3.3%.

In recent years in China, fluoride in blood has been measured with serum or plasma. Generally, at least 3-4 ml blood is needed for the determination. Consequently, patients dislike having the test. In a new method reported here, only 20m l blood from earlobe suffices, with much less stress and discomfort for the patient. The method is accurate and reliable. It is also simple, convenient, and easy to master.

Materials and Methods

Apparatus: Fluoride ion-selective electrode model CBS-3 (made in Changsha, China), calomel reference electrode Model-232, Digital MV meter. Magnetic stirrer Stirring bar, Micro-injector (5 ml, 20 ml, 500 ml), and Spring needle.

Stock Fluoride Solution: Sodium fluoride ion concentration 1.0 m g/ml.

TISAB: 2% (W/V) NaOH solution (50 ml) to which was added 6% (v/v) glacical acetic acid water solution (50 ml).

General Procedure:Blood (20 m 1) obtained by pricking the earlobe was measured by the micro-injector (20ml) into the 1000 ml cell, and 380 ml of TISAB was added by micro-injector. The cell containing the solution was stirred magnetically. The tips of the ion-selective and reference electrodes were then placed just blow the surface, and 10 min were allowed before the final MV (El) reading was recorded. Then 4 ml of the reference fluoride solution (1.0 m g/ml)was added, and 5 min were allowed before the final MV (E2) reading was recorded. Then 400 ml of TISAB was added, and another 5 min were allowed to elapse before the final MV (E3) reading was recorded.

$$F\ (\mu g/ml) = Cs. \frac{Vs / (Vx+Vs)}{10^{\text{Log2 (E1-E2) / (E3-E2)}} - Vx\ (Vx+Vs)}$$

Note: **F** is the final fluoride ion concentration in the earlobe blood, **Vx** is volume of the blood (20m l), Cs is the final fluoride ion concentration of the reference fluoride solution which was added, and **Vs** is volume of me

stock fluoride solution which was added.

Results

Replicated Test: Five 20 m l blood samples were taken from the earlobe of a man, and processed as in the general procedure. The fluoride ion concentration was 0.173 - 0.188 m g/ml, and the coefficient of variation was 3.30%. The results are present in Table 1.

Table 1. Results of Replicated Test

Sample	El	E2	E3	F(m g/ml)	M±SD	CV(%)
1	191.5	161.9	177.9	0.173		
2	190.8	160.5	176.2	0.188		
3	191.9	161.5	177.4	0.184	0.182 ±0.006	3.30
4	190.8	161.2	176.7	0.184		
5	190.7	160.8	176.7	0.179		

Recovery Test: After one of each group of ten samples was measured with the same general procedure, the other one is ready for recovery test. The average recovery rate was 98.76 ±3.93%.

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Reference

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