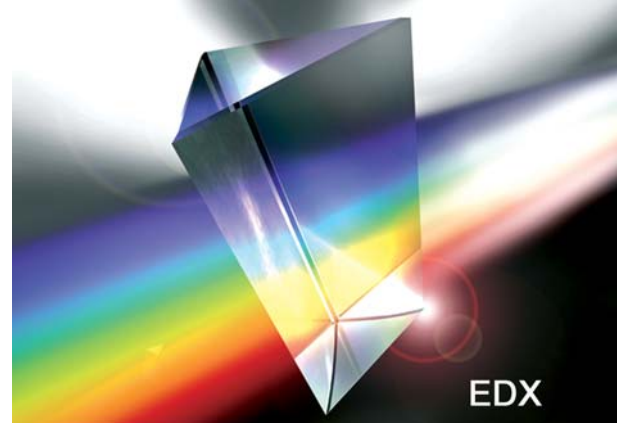


# Application Note

## EDXRF Analysis of P, Cl, K and Ca in Blood



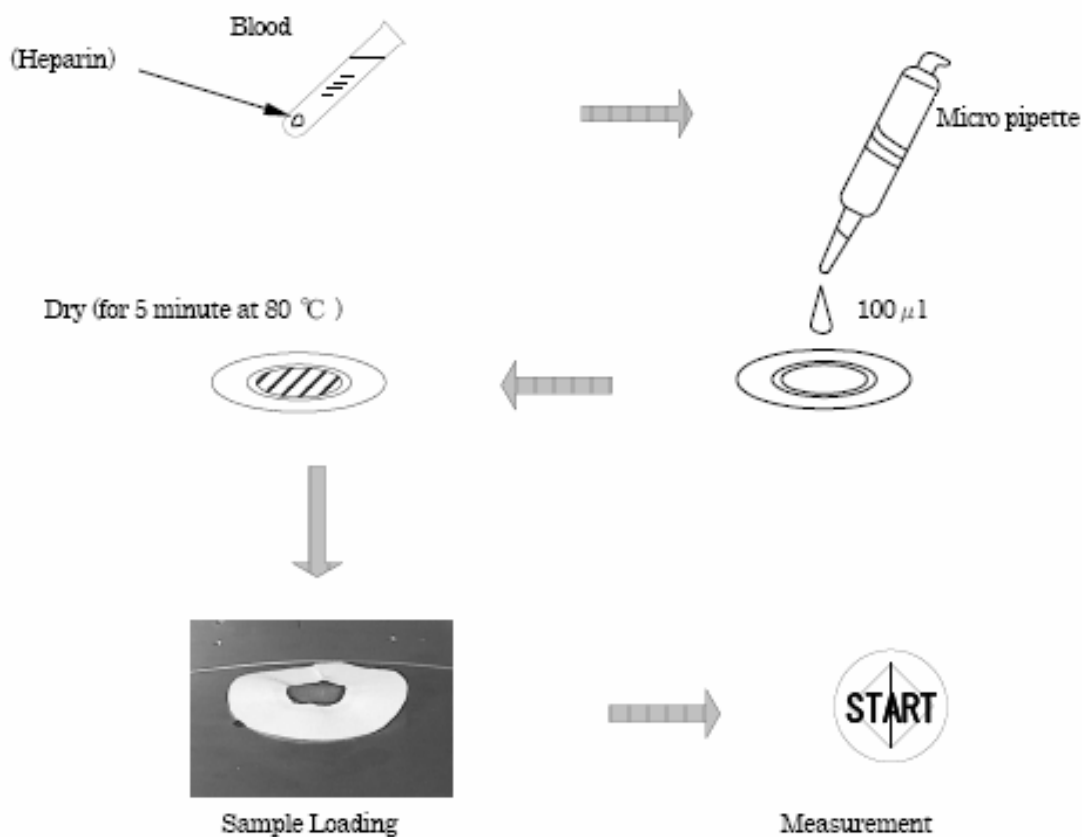
EDX is effective for quick screening analysis of tests for electrolytes (such as P, Cl, K, Ca) in blood. Carrying out the analysis in air with these light elements results in the X-ray fluorescence from the sample being absorbed by the air, consequently lowering the sensitivity. The analysis therefore needs to be carried out either in helium or a vacuum. Though it is impossible to directly analyze a liquid such as blood in a vacuum, the liquid can be dropped onto filter paper, dried, and then analyzed in a vacuum. Shown below is an example of such a qualitative analysis.

### Sample

Blood to which the anticoagulant Heparin has been added (Heparin is unnecessary if the sample is prepared as shown below).

### Sample Preparation

After 100  $\mu\text{l}$  of the sample has dropped onto the filter paper, the paper is dried for 5 minutes at 80  $^{\circ}\text{C}$  (If heparin is not added the paper is dried at normal temperature). This is described in the diagrams below.



## The Result of the Qualitative Analysis of Electrolytes in Blood

The Results of the qualitative analysis of electrolytes such as P, Cl, K, and Ca present in the blood is shown in Fig.1. P-Ca have been detected (S has been detected as well, but it is assumed that this is from the Heparin). The reference values of these constituent elements for an adult male are shown in Table 1.

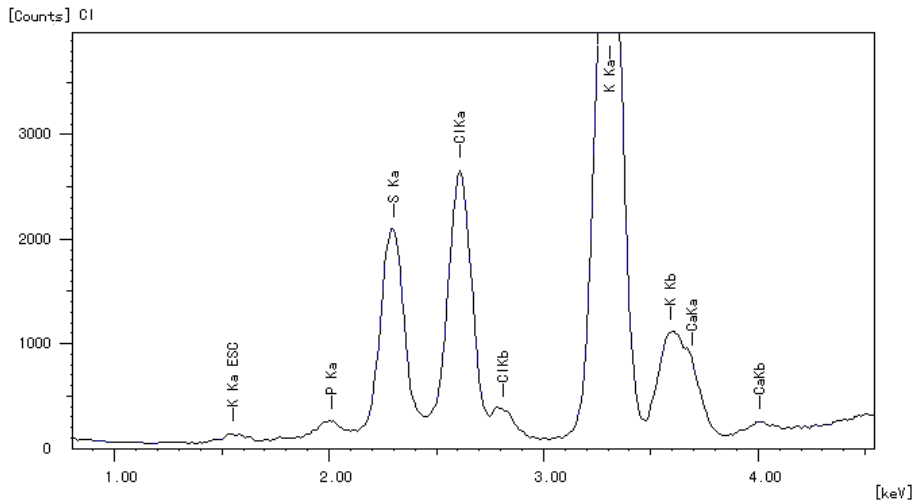


Fig.1 Qualitative Analysis of Electrolytes in Blood

Table 1 Reference of Electrolyte in Blood<sup>1)</sup>

P (Inorganic)	Cl	K	Ca
2.6-4.4 mg/dl (26-44 ppm)	97.8-102.6 mEq/l (0.35-0.36 %)	3.5-4.8 mEq/l (137-187 ppm)	8.6-10.4 mg/dl (86-104 ppm)

## Comparison of the Atmosphere in which Analysis was Carried Out

The various sensitivities and methods are compared and summarized in Table 2 for the liquid and filter methods in air, vacuum and helium.

Table 2 Comparison of Atmospheres

	Air	Vacuum	He Atmosphere
Filter Paper	• Simple, fast, drying not necessary	• Drying necessary	• Drying not necessary
Liquid	• Simple, fast, feasible	× Not possible	• Possible
Sensitivity	• Reduces with elements lighter than Ti	• Good	• Good

## Analytical Conditions

Instrument: EDX-700

X-ray Tube: Rh target

Filter: Al

Voltage - Current: 15 kV-1000 µA (Auto)

Measurement Diameter: 10 mm

Atmosphere: Vacuum

Measuring Time: 500 sec

Dead Time: 21 %

## Reference

Extensive Blood/Urine Chemistry Tests, Immunological Tests – How to Interpret the Values – (First Volume) Nihon Rin-rin Special Autumn Issue 1985, Nihon Rin-rin sha.