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**NATIONAL OCCUPATIONAL HEALTH STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GBZ/T 316.3-2018

**Determination of lead in blood -- Part 3: Atomic fluorescence
spectrometry method**

血中铅的测定 第3部分：原子荧光光谱法
(English Translation)

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Foreword

This standard is formulated in accordance with the Law of the People's Republic GBZ/T 316-2018 "Determination of lead in blood" is divided into three parts.

- Part 1. Graphite furnace atomic absorption spectrometry;
- Part 2. Inductively coupled plasma mass spectrometry;
- Part 3. Atomic Fluorescence Spectrometry.

This part is the third part of GBZ/T 316.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

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1 Scope

This part of GBZ/T 316 specifies atomic fluorescence spectrometry for the determination of lead in blood.

This section applies to the determination of lead in the blood of occupational contacts.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document.

For undated references, the latest edition (including all amendments) applies to this document.

General rules for biological monitoring of GBZ/T 295 occupational population

3 Principle

The blood sample (hereinafter referred to as the blood sample) is deproteinized with nitric acid, and the supernatant is taken after centrifugation, and the hydride is reduced to a wavelength of 283.3 nm.

Next, the lead content was measured by an atomic fluorescence spectrometer.

4 Instruments

4.1

Volumetric flask, 10mL.

4.2

stoppered polyethylene centrifuge tube, 5mL.

4.3

High-speed centrifuge, the speed is greater than 10000r/min.

4.4

Vortex mixer.

4.5

Micropipettes, the range is 20 μ L ~.200 μ L, 0.5mL ~ 5.0 mL.

4.6

Atomic Fluorescence Spectrometer with high performance lead hollow cathode lamp and hydride generation device.

5 Reagent

5.1

Deionized water.

5.2

Nitric acid, $\rho_{20}=1.42\text{g/mL}$, excellent grade pure.

5.3

Nitric acid solution (for sample processing and current carrying), 3.5% (V/V). Dilute 3.5 mL of nitric acid to 100 mL with water.

5.4

sodium hydroxide solution, 30g/L.

5.5

Reducing agent solution. Weigh 10g potassium borohydride (excellent grade pure), dissolve in sodium hydroxide solution, add 20g potassium ferricyanide (analytical grade) and 10 g of boric acid (premium pure), then dissolved in sodium hydroxide solution and diluted to 1000 mL.

5.6

Lead single element standard solution.

6 Sample collection, transportation and storage

According to GBZ/T 295.

The collected samples and sample blanks are placed in a clean container for refrigerated transport.

The sample can be stored for half a year at $-20\text{ }^{\circ}\text{C}$.

7.1 Instrument Operation Reference Conditions

See Table 1.

Table 1 Instrument operation reference conditions

Wavelength/nm 283.3 lamp current/mA 60 Atomizer temperature/ $^{\circ}\text{C}$.200 cathode auxiliary lamp current/mA 25 Photomultiplier tube negative high voltage/V 270 delay time/s 1.0 Atomizer height/mm 8 reading time/s 8 Carrier gas (Ar) flow rate/(mL/min) 400 injection volume/mL 0.8 Shielding gas (Ar) flow rate/(mL/min) 800 reading method peak area

7.2 Preparation of the standard series

Dilute lead standard solution with nitric acid solution to prepare 0.0µg/L, 2.0µg/L, 5.0µg/L, 10.0µg/L, 15.0µg/L, 20.0µg/L, 30.0µg/L the lead standard series are installed in 7 volumetric flasks, numbered 1~7.

7.3 Processing of samples and sample blanks

The frozen blood sample was taken out and returned to room temperature. Shake well, take 0.10 mL, and place it in a centrifuge tube containing 2.90 mL of nitric acid solution.

In the middle, immediately cover the lid, shake vigorously, then mix well in the vortex mixer for 5 min, centrifuge at 10000 r/min for 10 min, take the supernatant the liquid is measured.

Blank processing of the sample. 2.0 mL of water was taken with a blood collection needle and placed in a blood collection tube, and shaken, and the remaining treatment steps were the same as the sample.

7.4 Determination of standard series, samples and sample blanks

Refer to the operating conditions of the instrument, adjust the instrument to the best measurement state, the injection volume is 0.8mL, respectively determine the standard series, each concentrated Repeat the measurement 3 times, the average fluorescence intensity of the 2nd to 7th minus the fluorescence intensity of the 1st, and the fluorescence intensity average to the lead concentration (µg/L) Draw a standard curve or calculate a regression equation.

The sample solution and the sample blank solution are determined by measuring the operating conditions of the standard series, and the measured fluorescence intensity value is determined by a standard curve or a regression curve.

The concentration of lead (µg/L) was calculated.

8 Calculation

Calculate the concentration of lead in blood according to formula (1).

$$C = C_0 \times F \quad (1)$$

In the middle

C - the concentration of lead in the blood, µg/L;

C₀--lead concentration from standard curve or regression equation (minus sample blank), µg/L;

F -- sample dilution factor.