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

GBZ/T 316.1-2018

Replacing WS/T 20-1996

**Determination of lead in blood -- Part 1: Graphite furnace
atomic absorption spectrometry method**

血中铅的测定 第1部分：石墨炉原子吸收光谱法

(English Translation)

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4 Triton dilution - graphite furnace atomic absorption spectrometry

4.1 Principle

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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 first part of GBZ/T 316.

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

This section replaces WS/T 20-1996 "Graphite Furnace Atomic Absorption Spectrometry for Lead in Blood".

Compared with WS/T 20-1996, the main changes are as follows.

- The operating conditions of the instrument are modified to the reference conditions for instrument operation;
- Improved standard formulation and sample handling methods;
- The background correction system of the instrument was clarified.

This section drafted by. China Center for Disease Control and Prevention, Occupational Health and Poison Control.

1 Scope

This part of GBZ/T 316 specifies graphite furnace atomic absorption 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

3.1 Principle

Blood samples (hereinafter referred to as blood samples) are deproteinized with a nitric acid solution and measured by graphite furnace atomic absorption spectrometry at a wavelength of 283.3 nm.

Determine the lead content.

3.2 Instrument

3.2.1

Volumetric flask, 10 mL.

3.2.2

stoppered polyethylene centrifuge tube, 1.5mL.

3.2.3

Vortex mixer.

3.2.4

Centrifuge, the speed is greater than 10000r/min.

3.2.5

Micropipettes, the range is 20 μ L~200 μ L, 100 μ L~1000 μ L.

3.2.6

Atomic absorption spectrometer with graphite furnace, Zeeman or xenon lamp background correction device and lead hollow cathode lamp.

3.3 Reagents

3.3.1

Deionized water.

3.3.2

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

3.3.3

Nitric acid solution. 1% (volume fraction).

3.3.4

Nitric acid solution. 5% (volume fraction).

3.3.5

Bovine blood. Heparin anticoagulation, stored at -20 °C, shake it at room temperature. Low background human blood, sheep blood, etc. can also be used. Background lead content should be less than 50 $\mu\text{g/L}$.

3.3.6

Standard solution, using lead single element certified standard substance.

3.4 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 °C.

3.5.1 Instrument Operation Reference Conditions

Dry 80 ° C ~ 150 ° C 55s Ashing 300 ° C ~ 350 ° C 20s Atomization 1600 ° C 5s stop gas
Clear 2400 ° C 3s

3.5.2 Preparation of blood lead standard working curve series

The lead single element standard solution is diluted with a 1% nitric acid solution into a 50.0 µg/mL lead standard application solution, and then a 1% nitric acid solution is used to prepare a concentration of 0 µg/mL, 1.25 µg/mL, 2.50 µg/mL, 5.00 µg/mL, 10.00 µg/mL, and 12.50 µg/mL lead standard solution series. Take another 6 10mL Volumetric flasks, numbered from 1 to 6. Add 0.40mL of lead standard solution series with concentration of 0µg/mL~12.50µg/mL, respectively, and then use the bovine blood to make up the volume.

To the scale, the blood lead working curve is prepared at concentrations of 0µg/L, 50µg/L, 100µg/L, 200µg/L, 400µg/L, and 500µg/L.

Quasi-solution series. The preparation method is shown in Table 1.

Table 1 Blood lead working curve standard series configuration

Volumetric flask number	1	2	3	4	5	6	Lead standard solution series/(µg/mL)	0	1.25	2.50	5.00	10.00	12.50
Lead standard solution series/mL	0.40	0.40	0.40	0.40	0.40	0.40	Take bovine blood/mL	9.60	9.60	9.60	9.60	9.60	9.60
Lead standard solution in blood/(µg/L)	0	50	100	200	400	500							

3.5.3 Blood lead standard working curve solution series, sample and sample blank pretreatment method

3.5.3.1 Blood lead standard working curve solution series pretreatment method. take 0.15mL blood lead standard solution working curve series respectively in an ethylene centrifuge tube, add 0.60 mL of 5% nitric acid solution to each tube, cover immediately, shake vigorously, and then shake on a vortex mixer.

5 min, centrifuged at 10,000 r/min for 5 min, and the supernatant was used for measurement.

3.5.3.2 Sample Pretreatment Method. Remove the frozen blood sample and return to the laboratory temperature. Shake well and mix well, remove 0.15mL, place in a 1.5 mL stoppered polyethylene centrifuge tube, the remaining treatment steps are the same as above.

3.5.3.3 Sample blank pretreatment method. 2.0 mL water was taken with a blood collection needle and placed in a blood collection tube, and shaken. The remaining treatment steps were the same as above.

3.5.4 Determination of blood lead standard working curve solution series, sample and sample blank

3.5.4.1

Determination of blood lead standard working curve solution series. adjust the atomic