

ICS 13.100
CCS C 60



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

GBZ/T 317.2-2018

**Determination of cadmium in blood -- Part 2: Inductively
coupled plasma mass spectrometry method**

血中镉的测定 第2部分：电感耦合等离子体质谱法

(English Translation)

Issued on: August 16, 2018

Implemented on: January 1, 2019

Issued by: National Health and Family Planning Commission

Table of Contents

Foreword	
1 Scope	
2 Normative references	
3 Principle	
4 Instruments	
5 Reagent	
6 Sample collection, transportation and storage	
7 Analysis steps	
7.1 Preparation of blood cadmium standard series	
7.2 Pretreatment of blood cadmium samples and sample blanks	
7.3 Determination of blood cadmium standard solution series, samples and sample blanks	
7.4 Quality control of the inspection process	
8 Calculation	
9 Description	

Foreword

This standard is formulated in accordance with the Law of the People's Republic GBZ/T 317 "Determination of Cadmium in Blood" is divided into two parts.

-- Part 1. Graphite furnace atomic absorption spectrometry.

-- Part 2. Inductively coupled plasma mass spectrometry.

This part is the second part of GBZ/T 317.

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

This section is mainly drafted by. China Center for Disease Control and Prevention, Occupational Health and Poison Control Institute, Guangdong Provincial Occupational Disease Prevention and Treatment Institute, Jiangsu Provincial Center for Disease Control and Prevention, Shandong Institute of Occupational Health and Occupational Diseases.

1 Scope

This part of GBZ/T 317 specifies inductively coupled plasma mass spectrometry for the determination of cadmium in blood.

This section applies to the determination of cadmium and its compounds 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.

GBZ/T 295 General rules for occupational health biological monitoring

3 Principle

Blood samples (hereinafter referred to as blood samples) were directly diluted with 0.5% nitric acid/0.01% Triton X-100 mixture to give (Rh, 10.0 µg/L) as an internal standard, the concentration of cadmium in the diluent was measured by inductively coupled plasma mass spectrometry.

4 Instruments

4.1

Blood collection supplies. disposable blood collection needle, sterile cotton swab, lithium heparin (sodium) vacuum blood collection tube, etc.

4.2

Volumetric flask. 5 mL.

4.3

Polyethylene centrifuge tube. 15 mL.

4.4

Vortex mixer.

4.5

Micropipette. The range is from 100 µL to 1000 µL.

4.6

Inductively Coupled Plasma Mass Spectrometer. equipped with an autosampler.

Instrument operation reference conditions.

-- cooling gas flow rate. 12.5 L/min;

-- Auxiliary gas flow rate. 0.70 L/min;

- atomization gas flow rate. 0.88 L/min;
- peristaltic pump speed. 30 r/min;
- Nebulizer temperature. 3 °C.

Note: The above conditions are provided for the convenience of standard users. If the conditions are changed, the same effect should be achieved.

5 Reagent

5.1

Deionized water.

5.2

Nitric acid, excellent grade pure, $\rho_{20}=1.42$ g/mL; nitric acid solution, 0.2% (volume fraction).

5.3 0.5% nitric acid/0.01% Triton X-100 mixed solution.

5.4

Heparin anticoagulated bovine blood, stored at -20 °C, shake to room temperature when used. Heparin anticoagulated sheep blood can also be used. The background cadmium content should be lower than 0.2 µg/L.

5.5

Standard solution. Adopt nationally recognized standard solution of cadmium and strontium.

6 Sample collection, transportation and storage

6.1

Environmental conditions. The blood collection site should be clean and tidy, and there is no source of cadmium pollution.

6.2

Personnel requirements. After rigorous training and familiarity with the blood collection process, wear powder-free latex gloves.

6.3

Sample collection. 0.2% nitric acid solution, deionized water, and clean skin of the blood collection site, the blood sample should be collected more than 2 mL, and Shake immediately to prevent clot formation in the blood. Collect duplicate samples as necessary and one copy as a backup sample.

6.4

Sample blank. randomly take 2 parts of the blood collection container with the same batch number as the sample collection, and use the same batch of blood collection needle to extract 2.0 mL water into the blood collection tube.

Medium, as a sample blank.

6.5

Sample transportation. Store the collected samples and sample blanks in a clean container for refrigerated transport.

6.6

Sample storage. The sample can be stored for half a year at -20 °C.

7.1 Preparation of blood cadmium standard series

The cadmium monolith standard solution was diluted to 1.0 µg/mL cadmium standard application solution with 0.5% nitric acid solution, and then the concentration was 0.0 µg/L.

0.1 µg/L, 1.0 µg/L, 10.0 µg/L, 100.0 µg/L cadmium standard solution series (medium is 0.5% nitric acid solution).

7.2 Pretreatment of blood cadmium samples and sample blanks

Remove the frozen blood sample or sample blank and return to laboratory temperature. Shake well and mix well, take 0.50 mL, and place in 15 mL polyethylene in the centrifuge tube, add 4.50 mL of 0.5% nitric acid/0.01% Triton X-100 mixed solution and shake for testing. At the same time as a reagent blank, the same sample deal with.

7.3 Determination of blood cadmium standard solution series, samples and sample blanks

7.3.1

Determination of blood cadmium standard solution series. ICP-MS is adjusted to the best measurement state, each standard solution is determined, and each concentration is repeatedly measured.

Set 2 times. The working curve is calculated or the regression equation is calculated for the corresponding cadmium concentration (µg/L) by the count value (excluding the reagent blank).

7.3.2

Determination of sample and sample blanks. The sample and sample blanks are determined by the operating conditions of the measurement work series, and the count value is subtracted from the reagents.