SHIMADZU APPLICATION NEWS

LAAN-A-AA-E005A

● SPECTROPHOTOMETRIC ANALYSIS

No.A316A

Measurement of Litium (Li) and Aluminium (Al) in Human Sera

Lithium compounds are used as therapeutic agents in psychiatric disorders, however, due to the occurrence of side-effects if too much is taken, it is necessary to control the dosage by monitoring its concentration in blood sera.
In January, 2000, the United States FDA (Food and Drug Administration) announced the content restriction of aluminium in non-oral drugs (drip solutions, etc.). Orally ingested aluminium is almost all excreted as it is from the body, without being absorbed, and the majority of the portion that is absorbed in the body is thought to be excreted in the urine. However, it has been pointed out that individuals with renal dysfunction who take aluminium non-orally over a long period of time display symptoms of toxicity.
Introduced here are examples of analysis of lithium and aluminium in human sera (NIST 909b Human Sera Level Ⅰ and Ⅱ) by the flame method and furnace method, respectively.

■ Analysis of Li

Analysis was conducted using the calibration curve method.
1mL of sample was transferred to a test tube, 1mL of 1% Cs solution and 1mL of hydrochoric acid (1+10) were added, and the total volume was brought to 10mL using pure water to complete preparation of the analysis sample.
One measurement was conducted for each sample.

Table 1 Li Analytical Conditions

Wavelength	: 670.8nm
Slit width	: 0.5nm
Lamp mode	: NON-BGC
Flame type	: Air – acetylene
Acetylene flow rate	: 1.8L/min
Air flow rate	: 8.0L/min
Burner height	: 7mm
Burner angle	: 0˚

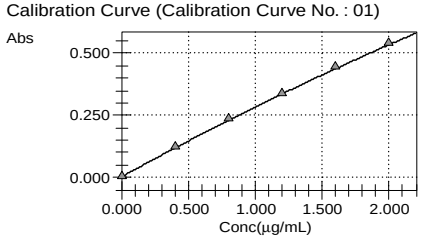


Fig. 1 Li Measurement Data

Table 2 Li Analysis Results

Sample Name	Analysis Value(μg/mL)	Certified Value(μg/mL)
NIST 909b Level Ⅰ	4.20	4.265 ±0.0034
NIST 909b Level Ⅱ	17.6	18.04 ±0.016

■ Analysis of Al

Analysis was conducted using the standard addition method.
1mL of Level Ⅰ sample was transferred to each of 5 test tubes, and 1mL of 1% Triton X-100 aqueous solution and 1mL of nitric acid (1+100) were added. In addition, 0, 1, 2, 3 and 4mL of 25ng/mL aluminium standard solution were added to the test tubes, and the volumes were brought to 10mL using pure water to complete preparation of the analysis samples.
The Level Ⅱ sample was processed in the same way as the Level Ⅰ sample, and a non-added and 5ng/mL (equivalent to 50ng/mL in serum) -added samples were prepared, and measurement was conducted by the simple standard addition method.
Two repetitions of the measurement were conducted.

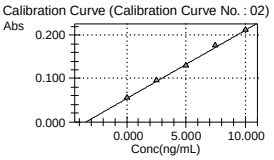
Table 3 Al Analytical Conditions

Wavelength : 309.3nm
Slit width : 0.5nm
Lamp mode : BGC-D2

Temperature Program (Tube used : platform tube)

Stage	Temp. (˚C)	Time	Heating Mode	Ar Gas Flow Rate (L/min)
1	120	10	RAMP	0.2
2	120	30	STEP	0.2
3	250	10	RAMP	0.2
4	250	10	STEP	0.2
5	1200	15	RAMP	1.0
6	1200	15	RAMP	1.0
7	2300	5	STEP	0.0
8	2600	2	STEP	1.0

Stage 7 is atomization stage.



Conc (ng/mL)	Abs
0.0000	0.0546
2.5000	0.0946
5.0000	0.1286
7.5000	0.1754
10.0000	0.2115

Abs=0.0158Conc+0.054
r=0.9991

MSA 1 : MSA Average

Concentration	ABS	BG	Position	Sample Amt.	%RSD
0.0000	0.0546	0.0010	2	20	2.4584

MSA 2 : MSA Average

Concentration	ABS	BG	Position	Sample Amt.	%RSD
2.5000	0.0946	0.0012	3	20	1.5689

MSA 3 : MSA Average

Concentration	ABS	BG	Position	Sample Amt.	%RSD
5.0000	0.1286	0.0018	4	20	1.7595

MSA 4 : MSA Average

Concentration	ABS	BG	Position	Sample Amt.	%RSD
7.5000	0.1754	0.0016	5	20	1.9351

MSA 5 : MSA Average

Concentration	ABS	BG	Position	Sample Amt.	%RSD
10.0000	0.2115	0.0010	6	20	2.1397

NIST 909b Level Ⅰ : MSA Result

Concentration	Dilution Factor	Meas Conc.	Meas Conc. Unit
3.4225	10.00	34.2250	ng/mL

NIST 909b Level Ⅱ : SMSA Average

Concentration	ABS	BG	Position	Sample Amt.	Dilution Factor	Meas Conc.	Meas Conc. Unit	%RSD
4.9544	0.0782	0.0008	7	20	10.00	49.5440	ng/mL	1.8977

NIST 909b Level Ⅱ +5ng/mL : SMSA Average

Concentration	ABS	BG	Position	Sample Amt.	Dilution Factor	Meas Conc.	Meas Conc. Unit	%RSD
9.9468	0.1570	0.0026	9	20	1.00	9.9468	ng/mL	1.3065

Fig. 2 Al Measurement Data

Table 4 Al Analysis Results

Sample Name	Analysis Value(ng/mL)
NIST 909b Level Ⅰ	34.2
NIST 909b Level Ⅱ	49.5

The certitied values were not available.

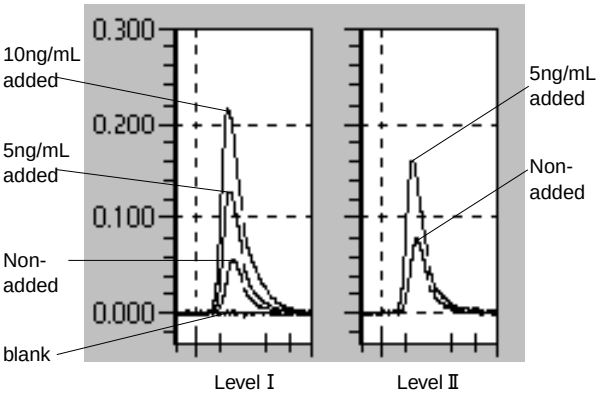


Fig. 3 Peak Profiles of Al

*The published data was not acquired using an instrument registered by Japanese pharmaceutical affairs law.

SHIMADZU

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