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Trace Element Analysis of the Traditional Medicine, *Jamu*

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Jamu is a form of traditional medicine which is widely known in Malaysia, Indonesia and Brunei. There are various types of Jamu ranging from cures for hypertension, flu, bronchitis, skin diseases, rashes as well as aphrodisiacs. They are made from ingredients obtained from tropical forests such as wild plants, various types of grass, fungi, tree bark and roots. Mixed in various proportions, it is produced in the form of powders, oils, cream and lotions. The price of Jamu can range from as little as US$0.25 to as much as US$50.00 or more depending on the authenticity of the product. Jamu can be easily obtained without a doctor's prescription. The popularity of Jamu as a health tonic and an energising potion has made it as indispensable medicine amongst not only the older generation but also the younger population of the Malay archipelago. As such it is of very great interest to carry out scientific analysis to determine the presence of trace elements which might be toxic to the users. To date there are no known studies that have been carried out on Jamu.

The present study was carried out to determine the elemental content of five traditional Jamu widely available in Malaysia. The method used for the multielement analysis was Instrumental Neutron Activation (INAA).

MATERIALS AND METHODS

Samples of five common Jamu were bought from local stores. All samples were in powder form and require no further treatment. Table 1 list the type of Jamu purchased together with their allleged cures. To avoid identification we label them as samples A, B, C, D and E. Each sample was placed in five separate polyethylene vials (2/5 dram) resulting in 25 filled sample vials and an additional two vials filled with Reference Material NBS Coal Ash (SRM 1632a). The net weight of the contents of each vial was between 200 - 500 milligrams. All vials were then heat sealed and placed inside an aluminium cylindrical container before being transferred into the reactor.

An Atomic Energy Unit research reactor TRIGA MKII with thermal flux of 4 x 10^{12} n/cm^2/sec was used to irradiate the samples and standard reference material. After ten hours of irradiation, the aluminium container was transferred out of the reactor core and left to cool for at least two weeks. The activities of the Jamu samples and standard were then measured with a gamma ray detection system. This consisted of a horizontal hyperpure germanium detector coupled to a 4096 channel pulse height analyser. The counting system has an energy resolution of 1.90 keV (FWHM) for the 1332 keV gamma ray of ^{60}Co. The presence of trace elements in the samples were deduced from the detection of gamma rays originated from the respective radioisotopes (Lederer 1978). The method of comparison (Ibrahim 1987) was used to calculate the concentration level of each element.

RESULTS AND DISCUSSION

Table 1 lists the five samples of Jamu and their cures.

Table 1 Types of Jamu used in the study

Type	Alleged cures
A	General health for men
B	General health for women
C	Stomach problems
D	Headaches
E	Energising vitality

The elements and their average concentration level (ppm) are shown in Table 2. A total of fifteen trace elements were detected; Co, Cs, Fe, La, Rb, Sc, Sm, Ca, Cr, Ga, Na, Cu, Ce, As and Sb. Their concentrations were found to be as low as 0.03 ppm for element samarium (Sm) up to as high as 38 ppm for copper (Cu).

The concentration of each element was generally of the same order for all the types of Jamu. For example element cesium (Cs) has a concentration ranging from 0.20 in type B to 0.33 ppm in type C. However for chromium (Cr), the concentration found in type A is as high as 7.1 ppm whereas for other types of Jamu the concentration ranges between 1 to 2 ppm only.

The third observation from our findings shows that the

Table 2 Concentration of trace elements found in the five Jamu

Element	concentration (ppm)				
	A	B	C	D	E
Co	1.16	0.63	0.74	0.61	0.52
Cs	0.27	0.20	0.33	0.29	0.20
Fe	0.14	0.07	0.09	0.06	0.05
La	0.39	0.56	0.31	0.35	0.33
Rb	29.00	13.00	28.00	22.00	15.00
Sc	0.40	0.16	0.22	0.17	0.14
Sm	0.07	0.23	0.05	0.05	0.04
Ca	0.17	0.23	0.17	0.14	0.16
Cr	7.1	1.29	1.01	1.01	1.94
Ga	0.98	0.60	0.49	0.35	0.40
Na	0.12	0.31	0.06	0.08	-
Cu	38.00	37.00	23.00	27.00	-
Ce	-	-	-	-	0.93
As	0.43	1.06	-	-	0.36
Sb	-	0.06	-	0.31	-

overall concentration of elements cobalt (Co), rubidium (Rb) and copper (Cu) are relatively higher when compared to the concentration of other elements. The toxic effect of Co is low in normal food intake. However, if the quantity inside the body exceeds 29.5 mg, side effects such as goiter, hypothyroidism and heart problem may occur (Mervyn,1982). Elemental rubidium (Rb) is useful to reduce the toxicity of lithium. A high dose of Cu could lead to Wilson's disease and Indian childhood cirrhosis.

We also observed the presence of arsenic (As) in three of the Jamu analysed (types A, B and E). The toxicity of As is well known. The World Health Organisation (WHO) has defined

the concentration of 50 ug/liter in water to be toxic.

Our study revealed that the commonly used traditional medicine Jamu contains several trace elements which are toxic in nature. It is therefore important for users to be cautious in the use of Jamu. Further research should be carried out to examine the long term effects on Jamu users.

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