LETTERS TO THE EDITOR

NORMAL LEVELS OF SERUM β_2 -MICROGLOBULIN IN JAPANESE SUBJECTS CLASSIFIED BY SEX AND AGE

Human β_2 -microglobulin (β_2 -MG) is a small protein (mol. wt. 11,800) originally isolated from the urine of patients with renal tubular disorders¹. It has been shown to be present on the surface of human lymphocytes^{2,3} and to be synthesized and secreted by lymphocytes in culture^{4,5}. Enhancement of β_2 -MG formation induced by phytohemagglutinin and mercuric ion in cultured lymphocytes⁶, and β_2 -MG production were found to be slightly promoted by phytohemagglutinin and cadmium ion⁷. An increase in serum levels has also been reported in patients with malignant disease⁸⁻¹⁰.

The normal level of serum β -MG in Caucasians was estimated by Evrin *et al.*^{11,12} and Teasdale *et al.*¹³, and that in Japanese by Kimura *et al.*¹⁴, Takasugi *et al.*¹⁵, Ikekubo *et al.*¹⁶, Harada *et al.*¹⁷, Tatsumi *et al.*¹⁸, Kanai *et al.*¹⁹ and Kuro *et al.*²⁰. However, there has been no report on the normal level of serum β_2 -MG in Japanese classified precisely by age and sex. In a previous study²¹, the normal level of urinary β_2 -MG was assessed.

In this report, precise normal levels for serum β_2 -MG in Japanese classified by age and sex are given together with the distribution of subjects of each class.

The subjects comprised 167 males and 65 females aged from 20 to 69 years, together with 112 males of the 10-19 age group. During the preceding one month, all subjects had passed a public health examination. They also passed laboratory test examinations for serum urea nitrogen, serum creatinine, and Fishberg-concentration tests or phenol-sulphophthalein tests, indicating values in the normal range. The serum β_2 -MG levels were determined with a phedebas β_2 -micro Test Kit (Shionogi Co.)

The type of distribution of data obtained was examined by the χ^2 (chi-square) test after calculation of the arithmetic mean and geometric mean in each age or sex group and total of male and female subjects (both sexes). The results of the χ^2 -test are given in Table 1. The type of distribution resembled a log normal distribution rather than a normal distribution. Both arithmetic and geometric means and their deviations ($m \pm 2SD$) for each of the 6 age groups at intervals of 10 years, are therefore shown in Table 1.

The correlation coefficients between age and β_2 -MG level were +0.234 for males, +0.455 for females and +0.297 for both sexes, and were significantly different from zero ($p < 0.001$).

Linear regression equations were calculated according to the least squares method, giving $y_1 = 0.0077x_1 + 1.048$ for males, $y_2 = 0.0131x_2 + 0.732$ for females and $y_3 = 0.0094x_3 + 0.948$ for both sexes, where y =serum β_2 -MG and x =age. The regression equations thus indicated a significant increase with advancing age of 0.077 mg/l for males, 0.131 mg/l

Table 1. β_2 -Microglobulin concentration of the serum in healthy Japanese classified by age and sex (mg/ml).

Years of age	Sex	N	Fitness				Observed values ¹⁾			
			Normal distribution		Log normal distribution		Normal distribution		Log normal distribution	
			m	m $\pm$ 2SD	m	m $\pm$ 2SD	m	m $\pm$ 2SD	m	m $\pm$ 2SD
10~19	M	112	—		*		1.47	0.81~2.13	1.44	0.96~2.16
	F	10	—		—		1.28	0.70~1.86	1.25	0.78~1.99
	T	122	—		*		1.45	0.80~2.11	1.42	0.94~2.14
20~29	M	21	*		*		1.29	0.93~1.64	1.27	0.97~1.67
	F	8	*		*		1.18	0.92~1.44	1.17	0.92~1.48
	T	29	*		*		1.26	0.91~1.60	1.24	0.91~1.60
30~39	M	33	—		—		1.33	0.88~1.78	1.31	0.93~1.85
	F	20	—		—		1.18	0.63~1.73	1.16	0.76~1.75
	T	53	—		—		1.27	0.76~1.79	1.25	0.76~1.79
40~49	M	35	—		—		1.36	0.54~2.18	1.32	0.80~2.15
	F	16	*		*		1.20	0.76~1.64	1.18	0.79~1.74
	T	51	—		—		1.31	0.57~2.05	1.27	0.57~2.05
50~59	M	50	—		*		1.43	0.65~2.22	1.39	0.84~2.30
	F	11	*		*		1.43	1.05~1.81	1.42	1.10~1.82
	T	61	—		*		1.43	0.71~2.16	1.39	0.71~2.16
60~69	M	28	*		*		1.56	0.40~2.73	1.46	0.75~2.84
	F	10	*		*		1.76	0.82~1.88	1.59	0.85~2.98
	T	38	*		*		1.62	0.48~2.76	1.49	0.48~2.76

N: Number of subjects, M: Male, F: Female, T: Both sexes.

Fitness: Classes fitted ($p>0.05$) to a normal distribution within the 6 age classes of males, females and both sexes, by the χ^2 test are indicated by an asterisk (*).

ne: Not examined.

¹⁾ Expressed as real quantities.

for females and 0.094 mg/l for both sexes per decade in the 20-29 age group.

For male subjects in the 10-19 age group, an average serum β_2 -MG level of 1.44 mg/l was obtained with a range (m $\pm$ 2SD) of 0.96-2.16 mg/l, when calculated as a log normal distribution and converted into real quantities. This level was a little but insignificantly higher than that for the 20-29 age group which had an average value of 1.24 mg/l and a range of 0.97-1.67 mg/l. This tendency paralleled the relation between urinary β_2 -MG level in 10-19 and 20-29 age groups described in a previous paper²¹⁾.

There was no significant difference between males and females. For all male subjects, in the 20~69 age group an average value of 1.35 mg/ml was obtained with a range

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($m \pm 2SD$) of 0.83–2.21 mg/ml, when calculated as a log normal distribution and converted into real quantities. For all female subjects, the average value was 1.27 mg/l with a range ($m \pm 2SD$) of 0.78–2.04 mg/l.

In the present study, somewhat higher levels in old age (50–69 age groups) than in adult age (20–49 age groups) were recognized. Serum β_2 -MG levels classified at intervals of 10 years should therefore be used as normal levels.

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