Selenium (Se) concentrations were determined in human serum, rice and wheat flour sampled in the city of São Paulo, Brazil, and compared with those sampled in Tokyo, Japan. Serum levels of Se were significantly lower in Japanese Brazilians than Japanese living in Tokyo. The samples of rice consumed by Japanese Brazilians in São Paulo contained 22.7 ng Se/g on average, which was about half the selenium level in rice consumed in Tokyo. Rice commonly consumed in São Paulo might be one of the factors to lower the serum level of Se.

Key words: Japan, Japanese Brazilian, rice, São Paulo, selenium, serum, Tokyo.

Introduction
Selenium (Se) is an essential trace element in humans, and blood measurement can be a useful measure of the biological nutritional Se status. Serum levels of Se fluctuate mainly due to differences in diet. In our previous study, dietary intake of Se in Japanese populations was indicated as adequate, but the serum Se concentration was much lower in Japanese Brazilians than in Japanese living inside Japan. About 250,000 Japanese immigrated to Brazil before 1978 and this is now the world’s largest Japanese population outside Japan. Of Japanese descendants living in Brazil, it is estimated that one-fourth reside in the city of São Paulo. Lifestyle and dietary changes in this migrant population were reported in the previous cross-sectional surveys.

The lower levels of serum Se in Japanese Brazilians in São Paulo may be attributed to Se levels in dietary components, as well as to changes in dietary patterns. Cereals were reported to be the primary sources of organic Se compounds and the differences in Se content depend on the regions producing them. In the present study we focused on Se concentrations contained in the raw materials of staple foods consumed most regularly in São Paulo and Tokyo, and possible contributors to Japanese Se status are discussed.

Materials and methods
Both rice and wheat flour samples were purchased in Tokyo and the Japanese residential quarter of the city of São Paulo. In Tokyo, 15 kinds of polished rice, grown in Akita, Niigata, Hokkaido, Miyagi, Ibaraki, Tochigi, Fukushima, Yamagata and Aomori in north-east Japan, and two kinds of wheat flour samples imported from the USA and Canada were obtained. In São Paulo, five kinds of polished rice produced in São Paulo and Rio Grande do Sol in southern Brazil, two kinds of wheat flour from São Paulo (in the city of Santos) and Ceará State (Fortaleza) in north-eastern Brazil were collected. These samples are most popularly consumed by Japanese living in São Paulo or Tokyo.

Subjects of this study were part of our cross-sectional epidemiological study described elsewhere. Briefly, in the city of São Paulo, subjects were randomly selected on the condition that they were first-generation Japanese immigrants or second-generation Japanese descendants; both parents were Japanese. The subjects were aged 40–69 years. In the Tokyo metropolis, subjects aged 40–49 years were randomly selected from residents of the Public Health Center district of Katsushika-ku, Japan. Blood was obtained by venipuncture after the subjects had abstained from food for at least 5 h. Serum samples were obtained from a total of 116 men in São Paulo (47 men aged 40–49 years), and 118 men in Katsushika-ku, Tokyo. Information on dietary patterns was collected through a questionnaire given by a trained nurse or nutritionist. The study was conducted in accordance with the internationally agreed ethical principles for the conduct of medical research.

The Se concentrations were determined by Watkinson’s method using fluorometry. All the rice and wheat samples were analysed in triplicate, and serum samples in duplicate. The reference materials were measured simultaneously and confirmed that the mean values were within the certified limits. Precision, as a coefficient of variation, of Se determination was 3.2%. The test of difference between Japanese Brazilians and Japanese in Tokyo was done by means of t-tests and Mann–Whitney U-test for continuous variables and Fisher’s exact test for categorical variables.

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Eating frequency

Se levels in raw food

These were analysed by Student’s t-test (no symbol), †Mann–Whitney U-test, and ‡Fisher’s exact test. NS, not significant.