〈Perspective〉

Japan’s National Health and Nutrition Survey requires additional statistical data relating to the Dietary Reference Intakes

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Summary The Dietary Reference Intakes (DRIs) in the United States, Canada, and Japan defined that nutrient intake levels in population were assessed by calculating the percentage of people whose intakes were below the Estimated Average Requirement (EAR) or Adequate Intake (AI). The National Health and Nutrition Survey (NHNS) in Japan has been reporting, annually, regarding the nutritional status of the mean and median values from the Japanese population. In order to evaluate the nutritional status of vitamins in the Japanese population, the NHNS must represent an additional statistical data relating to the DRIs (i.e., the percentage of people below EAR or AI).

Key words: National Health and Nutrition Survey, Dietary Reference Intakes, Vitamins, Nutrients

The Dietary Reference Intakes (DRIs) in the United States and Canada represented based on scientific findings, quantitative reference values of nutrient intake to be used for assessing and planning diets for healthy people.[1-4] The DRIs were a set of four nutrients-based reference values including the Recommended Dietary Allowance (RDA), Adequate Intake (AI), Estimated Average Requirement (EAR), and Tolerable Upper Intake Level (UL).

The RDA is a nutrient intake level calculated from EAR as EAR + 2 SD_{EAR}, which covered the needs of 97.5% of the population for each age and gender group (Fig. 1). The RDA is used for each

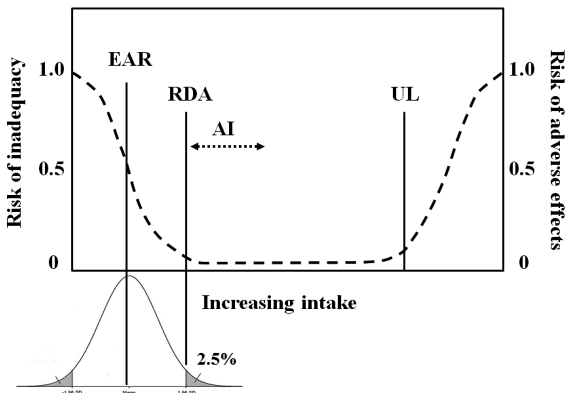

Fig. 1 Relationship of DRI values to risk of nutrient inadequacy and risk of adverse health effects. Risk of inadequacy means that probability of being at risk of deficiencies in certain nutrients

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individual's dietary planning as a goal for intake in a day. If scientific evidence does not sufficiently determine the EAR, the AI instead of RDA will be developed from the median (or mean) intakes of healthy individuals. The AI covered the needs of 97-98% of the population for each age and gender group. Therefore, the intention of AI is the same as RDA, which is to determine the nutrient intake of individuals.

The EAR is a nutrient intake level that is estimated to meet the requirement in 50% of healthy individuals in an age- and gender group. Setting the RDA depends on the accuracy of the EAR. Based on literatures or depletion/repletion experiments, the EAR was set as a nutrition level at this level and at least half of the subjects' nutritional statuses were adequate. The EAR is used to estimate the prevalence of inadequate intake within a group. In nutritional assessment for population, a percentage of people whose intake is lower than the EAR must be calculated. The lower the percentage, the more prevalence there is of dietary inadequacy. Simultaneously, regarding vitamins in which the AI was set instead of the RDA, the mean intake values in population may be compared with the AI.

The UL is the highest level of daily nutrient intake that could be tolerated without the possibility of causing adverse effects. Intake above this level has a risk of adverse effects. There is no assured benefit for healthy individuals if they take nutrients above the RDA or AI.

Nowadays, a National Health and Nutrition Examination Survey for energy and nutrients, such as carbohydrates, fats, proteins, vitamins, and minerals is annually conducted in most developed countries. The National Health and Nutrition Examination Survey (NHANES) is a program of studies designed to assess the health and nutritional status of adults and children in the United States.[5] In Japan, the corresponding examination is the National Health and Nutrition Survey (NHNS). The survey data is evaluated if the value is exceeding DRIs for Japanese people. (Table 1, lists ages 18 to 29 years). In this perspective, we summarized data from the 2016 NHNS in Japan[6], especially on vitamin nutrition, and require the NHNS to represent an additional statistical data relating the DRIs (i.e., the percentage of subjects taking vitamins below the EAR of AI).

In DRIs for Japanese (2015)[7], the EAR and RDA were set for vitamin A and seven water-soluble vitamins (vitamin B_1, vitamin B_2, niacin, vitamin B_6, vitamin B_{12}, folic acid, and vitamin C). The AI was set for three fat-soluble vitamins (vitamin D, vitamin E, and vitamin K) and pantothenic acid and biotin. The UL was set for vitamin A, vitamin D, vitamin E,

Table 1 Dietary Reference Intakes for Japanese, 2015[a]

		Males				Females			
		EAR	RDA	AI	UL	EAR	RDA	AI	UL
Vitamin A	μgRAE[b]	600	850		2700	450	650		2700
Vitamin D	μg			5.5	100			5.5	100
Vitamin E	mg			6.5	800			6.0	650
Vitamin K	μg			150				150	
Vitamin B_1	mg	1.2	1.4			0.9	1.1		
Vitamin B_2	mg	1.3	1.6			1.0	1.2		
Niacin	mgNE[c]	13	15		80	9	11		65
Vitamin B_6	mg	1.2	1.4		55	1.0	1.2		45
Vitamin B_{12}	μg	2.0	2.4			2.0	2.4		
Folic acid	μg	200	240		900	200	240		900
Pantothenic acid	mg			5				4	
Biotin	mg			50				50	
Vitamin C	mg	85	100			85	100		

[a] Ages, 18 to 29 years.
[b] Retinol activity equivalents.
[c] Niacin equivalents.

niacin, vitamin B_6, and folic acid. On the other hand, NHNS in Japan, 2016 (Table 2, lists ages 20 to 29 years) reported the mean intake values (and SD) and median intake values for the above vitamins, except biotin, in more than 20, 000 men and women one year and older. In this survey, median intake levels of vitamin K, nicotinic acid, vitamin B_{12}, folic acid, and pantothenic acid exceeded the EAR or AI, suggesting that nutritional status of Japanese population on these vitamins is adequate for maintaining their health. At this time, median intake levels of vitamin A, vitamin D, vitamin E, vitamin B_1, vitamin B_2, vitamin B_6, and vitamin C were below the EAR or AI. In the nutritional assessment for groups according to the definition by the DRIs, the percentage of people in whose vitamin intakes are below the EAR or AI must be evaluated. Low intakes were observed in ages 20 to 29 years, and the highest intake levels were observed in older adults aged ≥ 60 years. These vitamins require blood analysis to confirm the deficiency in future survey. In the nutritional planning for group, the percentage below the EAR must be either decreased toward zero, or the mean intake levels must be increased close to the AI. When mean intake levels of some vitamin are close to the EAR or AI, the percentage of people with insufficient intake of this vitamins would be suspected to be small. However, accurate percentage of population with intakes lower than the EAR or AI could not be estimated directly from the present data. The percentage has not been disclosed in the NHNS in Japan. Considering the percentage, the real nutritional status of society can be learned more easily, by comparing with the EAR or AI. We believe that the additional statistical data could contribute to future health promotion of the Japanese population.

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Table 2 National Health and Nutrition Survey (NHNS) in Japan, 2016[a]

		Amounts of intake (Males)			Amounts of intake (Females)		
		Mean	SD	Median	Mean	SD	Median
Vitamin A	μgRE[b]	489	736	335	439	528	339
Vitamin D	μg	6.2	8.1	2.5	5.9	6.7	2.9
Vitamin E	mg	6.4	2.9	5.8	5.7	2,8	5.3
Vitamin K	μg	199	154	148	189	145	135
Vitamin B_1	mg	0.97	0.51	0.83	0.77	0.35	0.72
Vitamin B_2	mg	1.14	0.54	1.02	1.01	0.44	0.93
Niacin	mgNE[c]	15.6	7.8	14.0	12.2	5.3	114
Vitamin B_6	mg	1.13	0.54	1.03	0.95	0.40	0.91
Vitamin B_{12}	μg	5.5	5.8	3.2	4.8	5.4	3.0
Folic acid	μg	244	123	218	229	108	211
Pantothenic acid	mg	5.57	2.17	5.26	4.73	1.70	3.46
Biotin	mg	-	-	-	-	-	-
Vitamin C	mg	67	46	59	65	45	53

[a] Ages, 20 to 29 years.
[b] Retinol equivalents.
[c] Niacin equivalents.

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