Variations in the associations of taste-related words with foods in diabetic patients in Japan according to gender, age, and geographical region: a multicenter study conducted in seven regions of Japan

Mitsuyoshi Takahara^{1,2} · Toshihiko Shiraiwa³ · Katsushige Abe⁴ · Yasuaki Ishimaru⁵ · Masahiro Iwamoto⁶ · Mitsuo Shimizu⁷ · Osamu Tomonaga⁸ · Hiroki Yokoyama⁹

Received: 2 October 2015 / Accepted: 21 December 2015 / Published online: 13 January 2016
© The Japan Diabetes Society 2016

Abstract Although expressions such as “sweet foods” and “fatty foods” are often used without hesitation when communicating with diabetic patients, little is known about what kinds of food items patients associate these expressions with. We therefore investigated these associations by conducting a questionnaire-based survey in seven outpatient clinics in Japan. Patients were asked which food items came into their mind when they heard the following taste-related words: sweet, fatty, salty, sour, hot, and bitter. Multiple answers were allowed. A total of 6,770 diabetic outpatients were analyzed in the current study. The three

food items that were most popularly mentioned as sweet foods were Japanese confectionery, cakes, and chocolates. Although a majority of the population (86 %) mentioned at least one of these three food items, the percentage of patients that mentioned a particular food item was at the most 58 %, indicating that patients did not always mention the same food items in association with each taste-related word. The associations varied significantly with gender and age (all $p < 0.05$); sweet foods were more likely to be associated with Japanese confectionery by old patients but with cakes and chocolates by young patients, whereas males less commonly mentioned these food items than females. Furthermore, there were significant geographic variations in the foods associated with a sweet taste. Such variations in taste-to-food association according to gender, age, and geographical region were also observed for the other taste-related words. In conclusion, the likelihood that a specific food item would be associated with a particular taste-related word varied among the diabetic patients, and there were significant gender, age, and region variations in the taste-to-food associations. These variations would be worth considering during nutrition counseling in clinical practice.

✉ Mitsuyoshi Takahara
takahara@endmet.med.osaka-u.ac.jp

¹ Department of Metabolic Medicine, Osaka University Graduate School of Medicine, 2-2, Yamadaoka, Suita City, Osaka 565-0871, Japan

² Department of Diabetes Care Medicine, Osaka University Graduate School of Medicine, 2-2, Yamadaoka, Suita City, Osaka 565-0871, Japan

³ Shiraiwa Medical Clinic, 4-10-24 Hozenji, Kashiwara City, Osaka 582-0005, Japan

⁴ Abe Diabetic Clinic, 16-13 Nakakasuga-machi, Oita City, Oita 870-0039, Japan

⁵ Dr. Yasuyo Ishimaru Memorial Kumagaya Diabetes Clinic, 1-1 Tamai-Minami, Kumagaya City, Saitama 360-0854, Japan

⁶ Iwamoto Medical Clinic, 496-1 Hirota-cho, Zentsuji City, Kagawa 765-0071, Japan

⁷ Shimizu Medical Clinic, 703 Iizuka-machi, Takasaki City, Gunma 370-0069, Japan

⁸ Diabetes and Lifestyle Center, Tomonaga Clinic, 4-2-23, Shinjuku, Shinjuku-Ku, Tokyo 160-0022, Japan

⁹ Jiyugaoka Medical Clinic, Internal Medicine, Minami 6-4-3, Nishi 6, Obihiro City, Hokkaido 080-0016, Japan

Keywords Taste-related word · Sweet foods · Fatty foods · Gender variation · Age variation · Geographic variation

Introduction

Dietary management is a key factor in the treatment of diabetes mellitus [1, 2]. Intervention in dietary habits is important for achieving and maintaining optimal control in clinical practice.

Expressions such as “sweet foods” and “fatty foods” are concise and convenient, and medical staff are unlikely to hesitate to use these expressions when communicating with diabetic patients [3, 4]. However, little is known about which kinds of food items patients associate these expressions with. It remains to be revealed whether they all associate the same specific food items with each taste-related expression. Also, the taste-to-food associations may vary according to attributes such as gender, age, and geographic region.

The aim of the current multicenter study was therefore to investigate the associations of taste-related words, such as “sweet” and “fatty,” with particular food items in Japanese diabetic patients.

Materials and methods

This questionnaire-based survey was conducted in seven outpatient clinics in Japan between April and December 2014. The participating institutions were as follows: (1) Jiyugaoka Medical Clinic, Internal Medicine, Obihiro City, Hokkaido (denoted “institution A”); (2) Shimizu Medical Clinic, Takasaki City, Gunma (“institution B”); (3) Dr. Yasuyo Ishimaru Memorial Kumagaya Diabetes Clinic, Kumagaya City, Saitama (“institution C”); (4) Diabetes And Lifestyle Center, Tomonaga Clinic, Shinjuku, Tokyo (“institution D”); (5) Shiraiwa Medical Clinic, Kashiwara City, Osaka (“institution E”); (6) Iwamoto Medical Clinic, Zentsuji City, Kagawa (“institution F”); and (7) Abe Diabetic Clinic, Oita City, Oita (“institution G”). A total of 6,814 outpatients with diabetes mellitus participated in the written questionnaire on taste-related words. Data on patient gender, age, and institution were also collected in the current study. Nineteen (0.3 %) and 24 patients (0.4 %) were excluded due to missing data on gender and age, respectively. Consequently, the current study analyzed 6,770 diabetic patients. The current study was performed in accordance with the Declaration of Helsinki and was approved by the ethics committee of Shiraiwa Medical Clinic. Informed consent was obtained from every participant in the current study.

Questionnaire

The written questionnaire on taste-related words asked which food items the words “sweet,” “fatty,” “salty,” “sour,” “hot,” and “bitter” were associated with. The questionnaire consisted of the following six questions:

- (1) What kind of foods come to your mind when you hear “sweet foods” (*amai-mono* in Japanese)?
- (2) What kind of foods come to your mind when you hear “fatty foods” (*aburakkoi-mono* in Japanese)?

- (3) What kind of foods come to your mind when you hear “salty foods” (*shiokarai-mono* and *shoppai-mono* in Japanese)?
- (4) What kind of foods come to your mind when you hear “sour food” (*suppai-mono* in Japanese)?
- (5) What kind of foods come to your mind when you hear “hot food” (*karai-mono* in Japanese)?
- (6) What kind of foods come to your mind when you hear “bitter food” (*nigai-mono* in Japanese)?

All six questions were open-ended and respondents answered with as many food items as they liked. Since the answers included a wide variety of food items, they were categorized by a team of nine national registered dietitians from the viewpoints of nutrition and cookery as follows. First, since some participants answered trade names, the responses were converted into generic names. Since answers varied from specific food names (e.g., Daifuku-mochi, pounded sweet rice stuffed with sweet Azuki bean paste) to group names (e.g., Japanese confectionery), they were thereafter grouped and classified based on existing databases and references [5–15]. Specific food names were accordingly integrated into group names with a 5 % or higher response rate, except that the group names were so comprehensive in meaning (e.g., “sweets” for sweet food) that the integration raised the response rate to 80 % or higher. This integration process was carried out repeatedly, lowering the threshold of the response rate each time, until the total number of food items mentioned reached around 100. These integration processes were carried out separately for each taste-related word. The classification was defined at meetings, based on the consensus among the nine national registered dietitians.

Statistical analysis

The tendency to associate each taste-related word with a specific food item was assessed as the percentage of patients who mentioned the food item in the study population. Gender-based, age-based, and geographic differences in associations were investigated using a logistic regression model.

Data are given as the mean and SD for continuous variables or as a percentage for discrete variables. $p < 0.05$ was considered significant, and 95 % confidence intervals (CI) were calculated. All statistical analyses were performed using R version 2.12.1 (R Development Core Team).

Results

The analyzed patients were 63 ± 12 years old and 65 % were male (Table 1). The participants gave a total of 16,759 responses (512 kinds of food items) for sweet foods,

Table 1 Characteristics of the study population

	Institution A in Hokkaido	Institution B in Gunma	Institution C in Saitama	Institution D in Tokyo	Institution E in Osaka	Institution F in Kagawa	Institution G in Oita	Overall population
<i>n</i>	742	947	965	931	917	1094	1174	6770
Male	501 (68 %)	567 (60 %)	603 (62 %)	711 (76 %)	537 (59 %)	679 (62 %)	821 (70 %)	4419 (65 %)
Age (years)	63 ± 13	65 ± 12	64 ± 12	57 ± 13	64 ± 12	64 ± 11	66 ± 12	63 ± 12
≥65 years	345 (47 %)	535 (56 %)	513 (53 %)	292 (32 %)	482 (53 %)	587 (54 %)	689 (59 %)	3443 (51 %)

Data are mean ± SD or *n* (%)

12,589 responses (571 kinds) for fatty foods, 10,512 responses (537 kinds) for salty foods, 9644 responses (373 kinds) for sour foods, 8786 responses (399 kinds) for hot foods, and 5328 responses (405 kinds) for bitter foods. After classification, the responses for sweet foods were finally integrated into 97 food items, with 40 of those food items mentioned by only one patient each. On the other hand, those for fatty foods were integrated into 84 items, with 30 items mentioned by one patient each; those for salty foods were integrated into 107 items, with 34 items mentioned by one patient each; those for sour foods were integrated into 88 items, with 41 items mentioned by one patient each; those for hot foods were integrated into 84 items, with 30 items mentioned by one patient each; and those for bitter foods were integrated into 80 items, with 39 items mentioned by one patient each. The five food items mentioned most often for each taste-related word are shown in Table 2. The percentage of patients who mentioned a particular food item was 40–70 % at the most, indicating that patients did not always associate the same food items with a particular taste-related word. Subsequent analysis confirmed that the taste-to-food associations were significantly gender and age dependent (Table 2). For example, old patients were more likely to associate sweet foods with Japanese confectionery and fruits, whereas young patients were more likely to mention cakes, chocolates, and ice creams as sweet foods. Males less commonly mentioned these food items (except for ice creams) than females. On the other hand, young male patients were more likely to associate fatty foods with meat (dishes) and ramen (Chinese soup noodles), whereas females more commonly mentioned fried foods, Chinese foods, and fat on meat. In addition to these gender-based and age-based variations, the associations also varied according to geographic region (Table 3).

We additionally investigated the percentage of patients who mentioned any of the most popularly mentioned food items for each taste. The top three food items mentioned for “sweet” and “fatty” covered a majority of the population (86 and 95 %, respectively) (Fig. 1). A majority of the population was even more reliably covered by the top

five items (Fig. 2). These findings were observed regardless of gender, age, and region. The top three to five items for the other taste-related words also covered a majority of the population (Fig. 2).

Discussion

The current study investigated the food items associated with taste-related words such as “sweet” and “fatty” by diabetic patients in Japan. Patients did not always associate common specific food items with their respective taste-related words. There were significant gender-based, age-based, and geographic variations in the associations of the taste-related words with food items.

Expressions such as “sweet foods” and “fatty foods” are convenient group names and are commonly used in scientific descriptions [16–19]. These expressions are also so concise and familiar to patients that medical staff are unlikely to hesitate to use them as collective names when communicating with diabetic patients [3, 4]. However, despite the familiarity of these expressions, the kinds of food items that diabetic patients actually associate with these expressions had not been elucidated before the present study.

The current study revealed that although a great majority of the patients mentioned one of the three (or at least five) most popularly mentioned food items for each taste, the likelihood that a particular food item would be associated with a particular taste varied among the patients. In addition, there were significant gender-based and age-based variations in the percentage of patients who mentioned a particular food item. These findings may to some extent reflect the general food preferences of each stratified population [20], although food associations are not the same as food preferences.

The current findings indicate that very brief conversations between medical staff and patients involving taste-related expressions (e.g., staff—patient: “Do you eat sweet foods?”—“No, I never eat sweet foods.” or “Cut down on sweet foods.”—“OK.”) lead to rather imprecise communication. Medical staff first need to determine the kinds of

Table 2 The five food items associated most often with each food taste by the patients, and the variations in these associations with gender and age

	Percentage (95 % CI)	Odds ratio of male versus female gender (95 % CI)	Odds ratio of old versus young age (95 % CI)
<i>Sweet</i>			
1. Japanese confectionery	58 (57–60 %)	0.67 (0.60–0.74)*	1.70 (1.54–1.88)*
2. Cakes	45 (44–47 %)	0.50 (0.44–0.55)*	0.33 (0.30–0.37)*
3. Chocolates	24 (23–25 %)	0.78 (0.69–0.88)*	0.44 (0.39–0.50)*
4. Fruits	15 (15–16 %)	0.78 (0.68–0.90)*	1.57 (1.37–1.79)*
5. Ice creams	12 (11–13 %)	0.98 (0.84–1.14)	0.54 (0.46–0.63)*
<i>Fatty</i>			
1. Deep-fried food	70 (69–71 %)	0.58 (0.51–0.65)*	0.96 (0.86–1.07)
2. Meat and meat dishes	43 (42–44 %)	1.23 (1.11–1.37)*	0.82 (0.74–0.90)*
3. Chinese food/stir-fried food	8 (8–9 %)	0.53 (0.44–0.63)*	0.99 (0.83–1.19)
4. Ramen (Chinese soup noodles)	6 (6–7 %)	1.72 (1.37–2.16)*	0.56 (0.45–0.68)*
5. Fat on meat	5 (5–6 %)	0.69 (0.55–0.85)*	0.97 (0.78–1.21)
<i>Salty</i>			
1. Shiokara (salted fermented seafood)	48 (47–49 %)	1.52 (1.37–1.70)*	0.83 (0.75–0.93)*
2. Tsukemono (Japanese pickles)	46 (45–48 %)	0.51 (0.46–0.57)*	1.23 (1.10–1.36)*
3. Salt-broiled fish and dried fish	15 (14–16 %)	0.89 (0.77–1.03)	1.27 (1.10–1.46)*
4. Umeboshi (pickled Japanese plum)	12 (11–13 %)	0.97 (0.83–1.13)	0.90 (0.77–1.04)
5. Tarako (Alaska pollock roe)	5 (5–6 %)	0.73 (0.59–0.90)*	1.27 (1.02–1.57)*
<i>Sour</i>			
1. Vinegar and vinegared dishes	55 (54–57 %)	0.62 (0.55–0.69)*	1.55 (1.40–1.72)*
2. Citrus fruits	42 (41–43 %)	0.91 (0.82–1.02)	0.51 (0.46–0.57)*
3. Umeboshi (pickled Japanese plum)	25 (24–26 %)	0.79 (0.70–0.89)*	0.85 (0.76–0.96)*
4. Fruits (other than citrus)	3 (3–4 %)	0.62 (0.47–0.83)*	0.73 (0.54–0.97)*
5. Tsukemono (Japanese pickles)	2 (2–2 %)	1.25 (0.84–1.85)	1.08 (0.75–1.56)
<i>Hot</i>			
1. Red pepper	40 (38–41 %)	1.21 (1.08–1.36)*	1.38 (1.24–1.53)*
2. Kimchi (Korean pickles)	37 (35–38 %)	0.68 (0.61–0.76)*	0.56 (0.50–0.63)*
3. Curry	17 (16–18 %)	1.25 (1.08–1.45)*	0.50 (0.43–0.58)*
4. Karashi (Japanese mustard)	7 (6–8 %)	0.67 (0.55–0.82)*	1.37 (1.13–1.68)*
5. Wasabi (Japanese horseradish)	7 (6–8 %)	0.75 (0.61–0.92)*	1.35 (1.10–1.65)*
<i>Bitter</i>			
1. Bitter melon	59 (57–61 %)	0.63 (0.55–0.72)*	1.06 (0.93–1.20)
2. Medicines and medicinal plants	14 (13–15 %)	1.63 (1.34–1.99)*	1.32 (1.10–1.58)*
3. Vegetables, including bell pepper	11 (10–12 %)	1.27 (1.03–1.56)*	0.74 (0.61–0.91)*
4. Sansai (edible wild plants)	8 (7–8 %)	0.47 (0.38–0.59)*	1.25 (1.00–1.57)*
5. Coffee	6 (5–7 %)	0.86 (0.67–1.10)	0.38 (0.29–0.50)*

Percentages were unweighted according to participating institutions. Odds ratios indicate the likeliness to mention the particular food item. Odds ratios of male versus female gender were adjusted for age and region, whereas those of old age (≥ 65 years) vs. young age (< 65 years) were adjusted for gender and region. * $p < 0.05$

food items that individual patients associate these taste-related expressions with, and then to communicate with the patients by stating specific food items rather than by using the vague taste-related expressions.

The current study also confirmed that there are regional variations in the associations of taste-related words with

particular food items (Table 3). Such associations may be influenced by the local food culture, leading to regional variations in those associations, even within the same country. Care should therefore be taken when conducting and interpreting multicenter surveys of dietary habits based on taste-related food items.

Table 3 Variations in the percentages of patients who mentioned each top-five food item

	Institution A in Hokkaido (%)	Institution B in Gunma (%)	Institution C in Saitama (%)	Institution D in Tokyo (Ref.) (%)	Institution E in Osaka (%)	Institution F in Kagawa (%)	Institution G in Oita (%)
<i>Sweet</i>							
1. Japanese confectionery	54	61	62	59	60	49*	63
2. Cakes	44*	35*	49	52	45*	47	46
3. Chocolates	26	23	31	25	24	18*	23
4. Fruits	12*	14	18	17	17	17	15
5. Ice creams	11*	11*	12*	18	10*	12*	12*
<i>Fatty</i>							
1. Deep-fried food	64	74*	76*	63	70*	70*	73*
2. Meat and meat dishes	48	30*	40	46	45	46	49
3. Chinese food/stir-fried food	6*	12	10	12	9	6*	7*
4. Ramen (Chinese soup noodles)	6*	4*	7*	11	6*	4*	9
5. Fat on meat	8	4	4	7	4	6	6
<i>Salty</i>							
1. Shiokara (salted fermented seafood)	60	40*	51	56	41*	37*	53
2. Tsukemono (Japanese pickles)	47	60*	57*	45	35*	42	40*
3. Salt-broiled fish and dried fish	15	7*	11*	17	21	14	25*
4. Umeboshi (pickled Japanese plum)	3*	13	19*	11	14	18*	13
5. Tarako (Alaska pollock roe)	4	3*	3*	6	8	7	11*
<i>Sour</i>							
1. Vinegar and vinegared dishes	54	64*	52	53	54	54	55
2. Citrus fruits	42	32*	44	43	42	39	53*
3. Umeboshi (pickled Japanese plum)	30	16*	29	28	20*	26	27
4. Fruits (other than citrus)	4	3	3	4	4	2	2
5. Tsukemono (Japanese pickles)	1	2	2	2	3	2	1
<i>Hot</i>							
1. Red pepper	46	46	45	42	32*	30*	37
2. Kimchi (Korean pickles)	36	44*	40	38	39	26*	34
3. Curry	20	12*	15*	21	19	13*	18
4. Karashi (Japanese mustard)	6	7	4	6	9	13*	8
5. Wasabi (Japanese horseradish)	15*	8	6	7	7	4*	6
<i>Bitter</i>							
1. Bitter melon	37*	54*	66	63	54*	60	75*
2. Medicines and medicinal plants	21*	10	12	12	15	17*	10
3. Vegetables, including bell pepper	11	10	11	11	17*	10	8
4. Sansai (edible wild plants)	14*	19*	7	5	7	3	5
5. Coffee	10	5	7	8	7	5	3*

Data are percentages adjusted for gender and age. * $p < 0.0083$ versus institution D (Bonferroni's correction was adopted)

Fig. 1 Percentages (and 95 % confidence intervals in *square brackets*) of patients who mentioned one or more of the top three food items associated with the terms “sweet” (a) and “fatty” (b)

Fig. 2 Percentages (and 95 % confidence intervals, shown as *error bars*) of patients who mentioned any of the top three (gray bars) or any of the top five (white bars) food items associated with the words “sweet” (a), “fatty” (b), “salty” (c), “sour” (d), “hot” (e), and

“bitter” (f). The overall percentages were unweighted according to the participating institutions. The institution-, gender-, and age-specific percentages were adjusted for gender and age, age and region, and gender and region, respectively

Japan has a rich and varied food culture that includes not only native Japanese cuisine but also many foreign dishes, some of which have been adapted to Japanese tastes while others have been imported more or less unchanged [21]. In addition, there are a wide variety of regional food cultures in Japan because the Japanese archipelago spreads wide from north to south [22]. It would be of clinical interest to

determine whether variations in food culture as large as those present in Japan also exist in other countries.

The current study had some limitations. First, it only surveyed gender and age as patient attributes. Although the dependencies of the taste associations on these basic attributes were worth investigating, it is unclear whether other attributes such as obesity, duration of diabetes,

occupation, and socioeconomic status also influence the associations. In addition, possible correlations of taste-to-food associations with metabolic control (including glycemic, lipid, and blood pressure control) are still to be explored. Given that metabolic control is considerably affected by food consumption, taste-to-food associations of diabetics may be an important factor in their degree of metabolic control. Second, the current study was conducted in only seven domestic regions; a much larger number of regions would need to be included to draw detailed conclusions about taste-to-food associations in the Japanese population in general. Third, the current study included only diabetic patients. Thus, it is unclear whether diabetes has any effect on the association of particular taste-related words with particular foods. Larger nationwide studies of both diabetic and nondiabetic subjects including more survey variables are needed to deepen our understanding of such taste-to-food associations.

In conclusion, although a majority of patients mentioned at least one of the most popularly mentioned food items associated with each taste-related word, the likelihood of an individual food item being mentioned in relation to a particular taste varied among the patients. The association of each food item with a taste-related word varied with gender, age, and geographic region. These variations would be worth considering during nutrition counseling of diabetic patients in clinical practice.

Acknowledgments The authors are very thankful to the following national registered dietitians who contributed to the food categorization in the current study: Saki Hashio, Ayaka Nakaoka, Yumi Hotta, Shiori Ozaki, Yuki Katada, Mami Fujimoto, Yukari Morioka, Atsuko Shimamura, and Eri Mano (Shiraiwa Medical Clinic, 4-10-24 Hozenji, Kashiwara City, Osaka 582-0005, Japan).

Compliance with ethical standards

Human rights statement All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later revisions of it. Informed consent or a substitute for it was obtained from all patients before they were included in the study.

Conflict of interest statement The authors declare that they have no conflict of interest associated with this manuscript.

References

- Bantle JP, Wylie-Rosett J, Albright AL, Apovian CM, Clark NG, Franz MJ, et al. Nutrition recommendations and interventions for diabetes: a position statement of the American Diabetes Association. *Diabetes Care*. 2008;31(Suppl 1):S61–78.
- American Diabetes Association. Foundations of care: education, nutrition, physical activity, smoking cessation, psychosocial care, and immunization. *Diabetes Care*. 2015;38(Suppl):S20–30.
- The Japan Society for the Study of Obesity. Guideline for treatment of obesity disease: behavioural therapy. *J Jpn Soc Study Obes*. 2006;12:33–9.
- Rissanen A, Hakala P, Lissner L, Mattlar CE, Koskenvuo M, Ronnema T. Acquired preference especially for dietary fat and obesity: a study of weight-discordant monozygotic twin pairs. *Int J Obes Relat Metab Disord*. 2002;26:973–7.
- The Subdivision on Resources, The Council for Science and Technology, Ministry of Education, Culture, Sports Science and Technology. Standard tables of food composition in Japan 2010. Tokyo: Zenkoku Kanpo Hanbai Kyodo Kumiai; 2010. ISBN: 978-4-915-39287-0.
- Ministry of Education Culture Sports Science and Technology. Food composition database. <http://fooddb.mext.go.jp/>. Accessed 3 Oct 2015.
- Ministry of Health Labour and Welfare. e-Healthnet. <http://www.e-healthnet.mhlw.go.jp/information/food>. Accessed 3 Oct 2015.
- Japan Soft Drink Inspection Association. Classification of soft drinks and carbonated drinks. http://seiryoken.jp/yomoyama/yomoyama_03.html. Accessed 3 Oct 2015.
- Kido S, Ikeda H. *Cookery*. 2nd ed. Kyoto: Kagakudojin; 2010. ISBN 978-4-759-80589-5.
- Itagi T. *Useful book of vegetables*. Tokyo: Takahashi Shoten; 2011. ISBN 978-4-471-03381-1.
- Japan Livestock By-product Association. <http://www.jlba.or.jp/>. Accessed 3 Oct 2015.
- Japan Wagashi Association. <http://www.wagashi.or.jp/>. Accessed 3 Oct 2015.
- All Japan Association of Confectionary Manufacturers. <http://www.zenkaren.net/>. Accessed 3 Oct 2015.
- All Nippon Spice Association. <http://www.ansa-spice.com/>. Accessed 3 Oct 2015.
- Research Center for Medicinal Plant Resources, National Institute of Biomedical Innovation, Comprehensive Medical Plant Database. <http://www.wts9.nibiohn.go.jp/mpdb.html>. Accessed 3 Oct 2015.
- Drapeau V, Despres JP, Bouchard C, Allard L, Fournier G, Leblanc C, et al. Modifications in food-group consumption are related to long-term body-weight changes. *Am J Clin Nutr*. 2004;80:29–37.
- Zellner DA, Loaiza S, Gonzalez Z, Pita J, Morales J, Pecora D, et al. Food selection changes under stress. *Physiol Behav*. 2006;87:789–93.
- Keskitalo K, Tuorila H, Spector TD, Cherkas LF, Knaapila A, Kaprio J, et al. The Three-Factor Eating Questionnaire, body mass index, and responses to sweet and salty fatty foods: a twin study of genetic and environmental associations. *Am J Clin Nutr*. 2008;88:263–71.
- Lanfer A, Knof K, Barba G, Veidebaum T, Papoutsou S, de Henaau S, et al. Taste preferences in association with dietary habits and weight status in European children: results from the IDEFICS study. *Int J Obes (Lond)*. 2012;36:27–34.
- Wansink B, Cheney MM, Chan N. Exploring comfort food preferences across age and gender. *Physiol Behav*. 2003;79:739–47.
- Web Japan. Japanese food culture. In: Japan fact sheet. <http://web-japan.org/factsheet/>. Accessed 13 July 2015.
- Ministry of Agriculture Forestry and Fisheries. Diversity of WASHOKU. In: Japanese food information. http://www.maff.go.jp/e/japan_food/. Accessed 13 July 2015.