究と系統的レビューを対象としていた。出版言語は、どちらのレビューも英語で出版された論文を対象とし、MEDLINE（Pubmed）、EMBASE、コクランレビューなどのプライマリーデータベースを対象とした網羅的な文献検索を行い、これに各自ハンドサーチした文献を加えていた。オンライン検索は、AHRQ−Ottawa では、1982 年から 2006 年までに発行された論文を対象としていた。AHRQ−Tufts では、まず、1969 年から 2008 年 9 月までに発行された論文全てを対象とし、さらにアップデートされた文献検索を 2008 年 9 月から 2009 年に絞り、再度、文献検索を行っていた。AHRQ−Ottawa は、データベースからの情報のみを対象としており、AHRQ−Tufts は、抄録、会議議事録など出版されていないものは対象外としていた。AHRQ−Ottawa では、リサーチクエスチョン 1 については、小児（0~18 歳）、出産可能年齢女性（19~49 歳）、高齢者（65 歳以上）を対象とし、それぞれ分けて検索していた。例えば、「骨の健康」については、アウトカムとして、骨密度、骨塩量、骨折、転倒、転倒に関連した身体指標（筋量、平衡感覚；高齢者と閉経後女性のみ)、カルシウム吸収(グループ 2 のみ)、副甲状腺ホルモン（小児、出産可能年齢女性のみ）、くる病（小児のみ）を対象としていた。AHRQ−Tufts では、アウトカムごとの検索用語について、次のように分類していた。1）体重か body mass index、2）成長（身長、体重）、3）骨折、骨密度、4）転倒、筋量、5）心血管疾患、6）高血圧、血圧、7）癌、新生物（腺腫、大腸ポリープ、乳房 X 線撮影）、8）自己免疫疾患（1 型糖尿病、尋常性乾癬、リウマチ性関節炎、多発性硬化症、炎症性大腸疾患、潰瘍性大腸炎、クローン病等）、9）子癇前症、子癇、妊娠高血圧症、10）早産、低体重、11）母乳、授乳、12）死亡、13）伝染病、14）骨軟化症（（耐容上限量（Tolerable Upper Intake Level; 以下「UL」と称す）のみ））、15）腎疾患、高カルシウム血症（UL のみ）。レビューには、上記アウトカムと、下記に示すビタミン D とカルシウムに関する検索用語を掛け合わせた検索を行っていた。使用されたビタミン D とカルシウムに関する検索用語は、次に示す通りである。“vitamin D”、“plasma vitamin D”、“25-hydroxyvitamin D”とその略語、“25-hydroxycholecalciferol”、“25-hydroxyergocalciferol”、“calcidiol”、“calcifediol”、“ergocalciferol”、“cholecalciferol”、“calciferol”、“calcium”、“calcium carbonate”、“calcium citrate”、“calcium phosphates”、“calcium malate”。系統的レビューの検索については、MEDLINE（Pubmed）、CENTRAL、コクランレビュー、英国ヨーク大学の Centre for Reviews and Dissemination によって製作されている Health Technology Assessments データベースを用いて、検索式は、上記に示したビタミン D とカルシウムの検索用語に、“systematic”、“evidence”、“evidence-based”、“meta-analysis”、“pooled analysis”など、系統的レビューに関する検索用語を掛け合わせて検索を行っていた。

3. *エビデンスのレベル*

表 1 に示すように、RCT の質的評価には、AHRQ−Ottawa は、ハダッドスコア[5]（表 2）を用いていた。さらに、AHRQ−Ottawa では、割り付けの隠匿化について、次に示すように個別に評価を行っていた。「適（Adequate）」が 1 点、「不適（Inadequate）」が 2 点、「不明（Unclear）」が 3 点とし、実際のアセスメントシートの割り付けの隠匿化の欄には、「A」、「I」、「U」と表記していた。観察研究（前向きコホート、症例対照研究を含む）

の質的評価には、AHRQ−Ottawa は、Harris ら[6]の序列システムを改変したものを用いていた。改変した Harris らの序列システムは、研究集団の代表性、バイアスや交絡因子、脱落について評価を行い、「不可」、「可」、「良」で示されるものであった。AHRQ−Tufts は、RCT と観察研究の質的評価のために、表 3 に示した 3 区分の序列システム[4, 7]を用いていた。

4. 総合評価

AHRQ-Ottawa は、研究の質、量、一貫性などから総合評価を行い、「良（good）」、「可（fair）」、「矛盾あり」の 3 段階で評価を行っていた。

5. 文献検索結果の概要

AHRQ-Ottawa

検索キーワード（130 語）を用いたオンライン検索によって、6566 件が抽出された。その後、抄録によるスクリーニングを行い、5119 件を除外し、計 1447 件が残った。次に、2 次スクリーニングとして、本文を精査し、採択基準を満たさない 765 件を除外し、682 件の論文が残った。除外理由は、リサーチクエスチョンが明記されていない（749 件）、入手不可（13 件）、英語論文でない（3 件）であった。次に、研究デザインについて精査を行い、リサーチクエスチョンごとの採択基準を満たさない 515 件を除外し、最終的に 167 件を採択した。その内訳は、RCT112 件、前向きコホート 19 件、症例対照研究 30 件、前後比較研究 6 件であった。除外理由については、QUOROM フォーマット[8]を用い、出典と除外理由について明記していた。

AHRQ-Tufts

検索キーワード（347 語）を用いたオンライン検索によって、18479 件が抽出された。その後、抄録によるスクリーニングを行い、17827 件を除外し、介入・観察研究 584 件、系統的レビュー68 件、計 652 件が残った。次に、2 次スクリーニングとして、本文を精査し、採択基準を満たさない 476 件を除外し、最終的に 176 件の論文を採択した。その内訳は、RCT 60 件、非 RCT 3 件、観察研究 102 件、系統的レビュー11 件であった。除外理由については、出典と除外理由について、明記されていた。

D. 考察

本研究では、アメリカ・カナダ DRIs のビタミン D・カルシウムの改訂の根拠となった主要なレビュー論文 2 報から、方法論部分を中心にまとめた。AHRQ−Ottawa、AHRQ−Tufts ともに、PICO 形式を用い、リサーチクエスチョンを明確化している。AHRQ−Ottawa は、ビタミン D のみに関するレビューであるが、それでも、大きく 5 つのリサーチクエスチョンが導き出され、クエスチョンによっては、さらにライフステージごとに細かく検討されているものもある。情報源については、AHRQ−Ottawa では、MEDLINE などの文献データベースからの情報のみ、AHRQ−Tufts では、MEDLINE などの文献データベースを使用し、出版されていないものは対象外としており、どちらも出版バイアスよりも、研究の質のバイアスによる影響を受けないよう配慮した情報源の選択を行っている。AHRQ−Ottawa では、リサーチクエスチョンごとに検索対象とする研究デザインを設定しており、これによって比較的バイアスが少なく、一定水準の研究を抽出することが可能であると思われる。リサーチクエスチョンに基

づいて、最終的に AHRQ-Ottawa では、167 件、AHRQ-Tufts では、176 件もの文献が採択されている。AHRQ-Ottawa では、一栄養素に限ったレビューではあるが、それでも厳格な採択基準によりこれほどの数多くの論文の中から、系統的にレビューされているということに注目すべきである。今後は、アメリカ・カナダの DRIs で参考・採択された文献を基に、「日本人の食事摂取基準」においても、ビタミン D について、AI から EAR、RDA に変更できるかどうか、十分検討する必要があるだろう。

今後、本研究が、次期「日本人の食事摂取基準」を策定する上で、レビュー作業を円滑に進める基礎資料として活用されることが望まれる。

F. 研究発表

1. 論文発表
   なし
2. 学会発表
   なし

G. 知的財産権の出願・登録状況（予定を含む）

1. 特許取得
   なし
2. 実用新案登録
   なし
3. その他
   なし

H. 引用文献

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trials. the QUOROM statement. Quality of Reporting of Meta-analyses. *Lancet* (1999) **354**, 1896-1900.

表1　レビュー方法論に関する情報

資料タイトル	Effectiveness and Safety of vitamin D in Relation to Bone Health [3]	Vitamin D and Calcium: A Systematic Review of Health Outcomes [4]
作成者	AHRQ-Ottawa	AHRQ-Tufts
作成年	2007	2009
組織編成	報告はEPC*、レビュー作業は、TEP†と外部査読者	報告はEPC*、レビュー作業は、TEPと外部査読者
レビュー作業者	栄養学、内分泌学、小児科学、生化学の専門家	栄養学（カルシウム、ビタミンD）、臨床分野、系統的レビューの専門家
アナリティック・フレームワークの発展（全体構造）	摂取量、血中25–OHD、血中活性型ビタミンD（1、 25（OH）D）と骨の健康	ビタミンD、カルシウム単独、あるいはビタミンDとカルシウム併用摂取による健康状態へ及ぼす影響
リサーチクエスチョンの設定	1. 血中25–OHDと関連する健康への暴露は何か 2. 食事からの摂取（強化食品・サプリメント）や日光暴露は血中25–OHDに影響するか 3. ビタミンDサプリメント摂取が骨密度、骨折、転倒へ及ぼす影響 4. 血中ビタミンDレベルを必要最低限維持でき、かつ非黒色腫／黒色腫皮膚癌のリスクが増加しない日光暴露量はどのくらいか 5. 健康に害となる(高カルシウム血症、高カルシウム尿症、骨軟化症)ビタミンDの上限量	1. ビタミンD、カルシウム単独、併用摂取による健康状態へ及ぼす影響 2. ビタミンD、カルシウム単独、併用摂取が、代替あるいは中間アウトカムとしての高血圧症、血圧、骨密度などへ及ぼす影響 3. 血中25–OHD、カルシウム平衡と健康状態との関連性 4. ビタミンD単独、カルシウムとの併用摂取が血清25–OHDへ及ぼす影響 5. 血清25–OHDと代替あるいは中間アウトカムとの関連性
出版言語	英語	英語
ヒトを対象とした研究に限定しているか	○	○
研究デザイン	1. RCT（可能な限りRCTのみとする） 1）RCT パラレルデザイン	1. 基礎的研究 1）RCT

	2）RCT クロスオーバーデザイン 3）RCT 要因デザイン 2. コホート 1）比較臨床試験（非 RCT） 2）前向きコホート研究 3）前向きコホート研究、後向きコホート研究 3. ケースコントロール 4. 前後研究 1）横断研究 2）前後比較研究 3）前向きコホート研究 4）ケースシリーズ（非比較研究） 5）ケーススタディ 6）連続的対照試験 7）生態学的研究 8）その他	2）非ランダム化試験、前向き比較試験 3）前向き研究、縦断研究、観察研究 4）前向きコホート内症例対照研究 2. 系統的レビュー 除外対象 横断研究、 後向き症例対照研究
情報源（文献データベース）	MEDLINE、CENTRAL、EMBASE、CINAHL、AMED、Biological Abstracts	MEDLINE、CENTRAL、コクランレビュー HTA
検索期間（年）	1982–2006	1969–2009
出版されていない研究からの情報源	文献データベースのみ	抄録や会議議事録等、出版されていないものは対象外
エビデンスのレベル	RCT：ハダッドスコア（表 2） 観察研究：Harris ら[6]の序列システム	3 区分の序列システム（表 3）
総合評価	3 段階評価（good、fair、inconsistent）	_§
探索語数	130 語	347 語
適格規準に沿った	6566 件	18479 件

抄録のスクリーニング		
文献の収集数	1447 件	652 件
採択文献数	167 件 RCT：112 件 前向きコホート：19 件 ケースコントロール：30 件 前後研究：6 件	176 件 基礎的研究（165 件） RCT：60 件 非 RCT：3 件 観察研究（コホート、コホート内症例対照研究）：102 件 系統的レビュー：11 件
除外文献の記載	○（出典と除外理由）QUOROM format [8]	○（出典と除外理由）
要約表の数	18	107

*EPC：Evidence-based Practice Center

†TEP：Technical Expert Panel

§表中の「–」は記述なし

表 2　ハダッドスコアによる RCT の質的評価 [5]

項目	質問内容
1	その研究は、ランダムに割り付けがされているか？（はい=1、いいえ=0）
2	その研究は、割り付けの方法が明記されており、かつ適切か？（はい=1、いいえ=0）
3	その研究は、二重盲検と明記されているか？（はい=1、いいえ=0）
4	その研究は、二重盲検の方法について明記されており、かつ適切か？（はい=1、いいえ=0）
5	その研究は、投与中止や脱落が記載されているか？（はい=1、いいえ=0）

表3　3区分の序列システムによるエビデンスのレベル分類[4,7)]

項目	研究の質	バイアスの可能性	内容
A	高	低い	最もバイアスの可能性が低く、結果に正当な根拠（以下に示す）がある質の高い研究である。 ・　一般的な研究デザイン ・　集団、セッティング、介入および比較群の明瞭な記述がなされている。 ・　アウトカムが適切に測定されている。 ・　統計および解析方法、報告の妥当性がある。 ・　エラーの報告がない。 ・　脱落者20%未満である。 ・　脱落者の報告が明瞭である。 ・　明瞭なバイアスがない。 ・　食事評価やバイオマーカーから、測定誤差の範囲内で栄養素摂取量の推定が行える。
B	中	やや高い	いくらかのバイアスの可能性はあるが、正当な根拠に不足はない研究である。 このカテゴリーでは、カテゴリー“A”のクライテリアのうち、リミテーションの評価やいくらかの問題について情報を満たせていないが、大きなバイアスではない。
C	低	高い	最もバイアスの可能性が高く、結果に正当な根拠がない質の低い研究である。 研究デザイン、解析方法、報告にいくつかの問題があるなど、記載しなければならない情報の大部分が欠落している。

Ⅳ. 研究成果の刊行に関する一覧

研究成果の刊行に関する一覧表

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
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Tokudome S.	Dietary Reference Intakes for Japanese. Foreword.	J Nutr Sci Vitaminol	59, suppl	S2	2013
Tsuboyama-Kasaoka N, Tsubota-Utsugi M, Imai E, Nakade M, Kasuga M.	Historical overview of the establishment of Dietary Reference Intakes for Japanese.	J Nutr Sci Vitaminol.	59, suppl	S6-S8	2013
Sasaki S.	Dietary Reference Intakes for Japanese 2010: basic theories for the development.	J Nutr Sci Vitaminol	59, suppl	S9-S17	2013
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Nagae A, Kuwabara A, Tozawa K, Kumode M, Takeuchi Y, Tanaka K.	Enteral nutrition and antibiotic use increase the risk for vitamin K deficiency in patients with severe motor and intellectual disabilities.	e-SPEN Journal,			in press
小林奈穂, 村山伸子, 稲村雪子, 久保田恵, 神田知子, 高橋孝子, 石田裕美.	給食施設における「日本人の食事摂取基準」の活用の現状（第一報）—病院および介護老人保健施設を対象とした質問紙調査—.	栄養学雑誌	70 記念号		印刷中

小林奈穂, 村山伸子, 稲村雪子, 久保田恵, 神田知子, 高橋孝子, 金光秀子, 辻ひろみ, 石田裕美.	給食施設における「日本人の食事摂取基準」の活用の現状（第二報）－高齢者施設を対象としたインタビュー調査―.	栄養学雑誌	70 記念号		印刷中
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Ⅴ. 研究成果の刊行物・別刷

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Dietary Reference Intakes for Japanese 2010

Editors

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Research Group of Health and Labour Sciences Research Grants "Research on the Application and Revision of the Dietary Reference Intakes for Japanese"

Preface

Preparing a Revised Version of the Dietary Reference Intakes

The 2010 version of Dietary Reference Intakes for Japanese (DRIs-J) has been prepared on the basis of the concept of DRIs in-line with the policy adopted for the DRIs-J 2005 version, which recommended that the criteria created be as evidence-based as possible.

The preparatory process accounted for as many as 40 working group-based conferences involving more than 50 researchers, who considered all studies of interest available to date, including domestic, international, and those studies and documents that served as the basis for the earlier version of DRIs. The 1,300 studies have been cited in the current DRIs-J 2010.

The following concept provided the basis for revising the existing DRIs. Generally, health disturbances associated with energy and nutritional intake are evaluated in terms of deficiency/insufficiency and excess, which may have implications for prophylaxis of lifestyle-related diseases. Therefore, the existing criteria for energy and nutritional intake, i.e., the DRIs, were re-formulated to address such issues. However, optimal energy and nutritional intake varies from individual to individual and within individuals and does not readily lend itself to calculation, thus calling for a probabilistic approach to its estimation.

In the current DRIs-J 2010, this approach allowed reference values to be estimated for energy as well as for 34 different nutrients. Beyond these estimates, the DRIs-J 2010 included recommendations on nutritional guidance, i.e., a description of the theoretical concept of the DRIs as a basis for "improvement of diet" and "management of food services," as well as associated considerations and a description of the theoretical principle adopted for the DRIs-J 2010. Furthermore, while providing estimates, the nutritional needs of individuals at each stage of their life have been carefully considered, with emphasized focus on infants, children, pregnant and lactating women, and the elderly; these were the stages that were given special attention during developing DRIs and when recommending DRIs.

Our future tasks include accumulating relevant high-quality evidence from Japanese and DRI-based studies, while characterizing the nutritional needs of individuals at different stages of their life and sorting the health issues associated with each of these stages.

Finally, only if the rationale for the indices used, scientific basis for the estimated values, and the process that led to the revision of DRIs have been fully appreciated can the DRIs be used meaningfully. Thus, it is not intended that the estimated reference values compiled in the DRIs are to be blindly adhered to, but that they serve as flexible criteria.

August 23, 2012

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Chairman, Expert Committee for "Dietary Reference Intakes for Japanese 2010"
President, National Center for Global Health and Medicine

Foreword

Preface to the English Version of the Dietary Reference Intakes for Japanese (DRIs-J) 2010

In order to prevent nutritional deficiencies, the Ministry of Health and Welfare, Japan first launched the Recommended Dietary Allowances for the Japanese in 1970 and has made periodic revisions every 5 years up to its 6th edition in 1999. The 7th version was issued in 2004 as the Dietary Reference Intakes for Japanese (DRIs-J) 2005. The current DRIs-J 2010 (for April 2010–March 2014) were established in 2009 by the Ministry of Health, Labour and Welfare (MHLW) on the basis of the Health Promotion Law.

The project to revise DRIs-J 2010 began in 2008. More than 50 scientists in Japan with proven expertise in the field of nutrition and physical activity were asked to participate in this program by the MHLW. In order to update the DRIs-J 2010 on a scientific basis, more than 1,300 articles were reviewed.

To avoid adverse effects of deficient/insufficient and excess and/or imbalanced consumption of energy and nutrients, the newly-edited DRIs-J 2010 incorporate 6 reference values based on sex, age group (life stage), and physical activity level–1 value for energy and 5 values for 34 nutrients–for healthy individuals and groups, including those with certain mild illnesses, such as hypertension, diabetes, or hyperlipidemia. However, the DRIs-J do not incorporate any dietary instructions/restrictions or prescribed diets.

The reference value for energy is the estimated energy requirement (EER), and the 5 reference values for the 34 nutrients include 3 for deficiencies–estimated average requirement (EAR), recommended dietary allowance (RDA), and adequate intake (AI), 1 for adverse effects–tolerable upper intake level (UL), and 1 for primary prevention of lifestyle-related diseases–tentative dietary goal for preventing lifestyle-related diseases (DG).

The 34 nutrients include major nutrients (protein, fat [total fats, saturated fatty acids, n-6 and n-3 polyunsaturated fatty acids, and cholesterol], carbohydrates [carbohydrate, dietary fiber], vitamins [fat-soluble vitamins: A, D, E, and K; water-soluble vitamins: B_1, B_2, niacin, B_6, B_{12}, folate, pantothenic acid, biotin and C]), and minerals (macrominerals: sodium, potassium, calcium, magnesium and phosphorus; microminerals: iron, zinc, copper, manganese, iodine, selenium, chromium and molybdenum).

The National Institute of Health and Nutrition proposed publication of the English version of the DRIs-J 2010 and all edited articles, which were prepared by the members involved in the research group for Research on the Application and Revision of the DRIs for Japanese as part of Comprehensive Research on Lifestyle-related Diseases including Cardiovascular Diseases and Diabetes Mellitus with Health and Labour Sciences Research Grants under the auspices of the MHLW. The articles provide compact descriptions of the DRIs-J 2010, including information on the historical overview of the establishment of the DRIs, basic theories for the development, basic concepts for their application, the DRI values for energy, protein, fat, carbohydrates, water-soluble vitamins, fat-soluble vitamins, macrominerals, microminerals, and the DRIs-J according to the life stage.

We sincerely hope this publication will be informative and useful for health professionals/staff engaged, particularly, in developing, planning, and implementing DRIs for the assessment of diet/nutrition and for the management of food services to individuals and groups. May it serve to promote/maintain health, prevent lifestyle-related diseases, including non-communicable diseases, and enhance the quality of life or well-being through diet, nutrition, and physical activity among the people of Asian Pacific areas/countries and worldwide.

August 16, 2012

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Historical Overview of the Establishment of Dietary Reference Intakes for Japanese

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Summary Although nutritional standards for Japanese were published by national organizations until the 1940s, the Recommended Dietary Allowances (RDAs) for Japanese was officially established in 1969 by the Ministry of Health and Welfare (presently Ministry of Health, Labour and Welfare). These RDAs were revised every five years until 2005, when they were established as Dietary Reference Intakes for Japanese (DRIs-J). The nutrients included in RDAs and DRIs-J were changed according to the health condition and eating habits of Japanese. The current version, DRIs-J 2010, comprises reference values for energy and 34 nutrients.

Key Words dietary reference intakes, Recommended Dietary Allowances, history, Ministry of Health, Labour and Welfare

Historical Overview

Many nutrients are presently recognized to play an important role in human nutrition not only because they are essential for growth and maintenance of health, but also because they play an important role in the reduction of risk of noncommunicable diseases. The values of nutrient intakes that make allowance for individual variation in requirements and provide a margin of safety above the minimal requirement to prevent deficiencies have traditionally formed the basis for the establishment of the Recommended Dietary Allowances (RDAs).

Preliminary values for nutrient requirements for Japanese were first described in 1926 in the book *Nutrition* by Dr. Tadasu Saiki (*1*), the founder of the National Institute of Nutrition (presently National Institute of Health and Nutrition) in Japan. The National Institute of Nutrition played a key role in conducting basic scientific studies and developing nutrient requirements for Japanese. In responce to food shortage resulting from World War II, some national organizations created nutritional standards independently for Japanese until around 1945. Since then nutritional standards for Japanese have been developed by the Prime Minister's Office (presently Cabinet Office, government of Japan) and the Science and Technology Agency (presently Ministry of Education, Culture, Sports, Science and Technology) to promote growth, to maintain health and physical strength, and to improve work efficiency.

From 1969, the Ministry of Health and Welfare became the presiding ministry to create RDAs in Japan (*2*). The RDAs used for the time period 1970–1975 were officially established by six committees. As shown in Table 1, RDAs was subsequently revised every five years until 2005 for the purpose of improving physique and corresponding to changes in population structure, economy or dietary habits (*2–8*). The concept of Dietary Reference Intakes was first introduced in the 6th revision of the RDAs (2000–2005) (*8*). In order to more comprehensively follow the approach used in devising the 6th revision of the RDAs, the 7th revision was established as the "Dietary Reference Intakes for Japanese (DRIs-J) 2005" by the Ministry of Health, Labour and Welfare (MHLW) (*9*). These DRIs-J were based on a systematic review of the evidence. The current version, "DRIs-J 2010," was created based on the Health Promotion Law by the MHLW (*10*).

DRIs-J expanded on the basic theories of the US/Canadian DRIs in order to create DRIs that are specific to the Japanese population. The DRIs-J were designed not only to prevent energy or nutrient deficiencies that may be caused by insufficient intake of energy or nutrients, but also for the primary prevention of lifestyle-related diseases caused by excess and/or imbalanced consumption of energy and nutrients. DRIs-J consists of six reference values (one for energy and five for nutrients) for the prevention of deficiencies, adverse effects by excess intake, and lifestyle-related diseases. In addition, the recommended dietary intake level is shown as a range rather than a singular value.

Historical Changes in Values for Energy and Nutrients

In 1926, Dr. Saiki proposed the concept used as the basis of future Estimated Average Requirement (EAR), Adequate Intake (AI) or Estimated Energy Requirement (EER), and he calculated the energy requirement for Japanese. Since that time, national organizations decided to

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Table 1. History of the development of Dietary Recommendations in Japan by Ministry of Health, Labour and Welfare.

Versions	Periods of use	Date recommendations were made	Contents
RDAs 1st (*2*)	Apr. 1970–Mar. 1975	Aug. 1969	Energy+10 Nutrients
RDAs 1st revision (*3*)	Apr. 1975–Mar. 1980	Mar. 1975	Energy+9 Nutrients
RDAs 2nd revision (*4*)	Apr. 1980–Mar. 1985	Aug. 1979	Energy+12 Nutrients
RDAs 3rd revision (*5*)	Apr. 1985–Mar. 1990	Aug. 1984	Energy+13 Nutrients
RDAs 4th revision (*6*)	Apr. 1990–Mar. 1995	Sep. 1989	Energy+15 Nutrients
RDAs 5th revision (*7*)	Apr. 1995–Mar. 2000	Mar. 1994	Energy+16 Nutrients
RDAs 6th revision —DRIs— (*8*)[1]	Apr. 2000–Mar. 2005	Jun. 1999	Energy+28 Nutrients
DRIs-J 2005 (*9*)	Apr. 2005–Mar. 2010	Oct. 2004	Energy+34 Nutrients
DRIs-J 2010 (*10*)	Apr. 2010–Mar. 2015	May 2009	Energy+34 Nutrients

RDAs, Recommended Dietary Allowances; DRIs, Dietary Reference Intakes.
[1] The concept of DRIs was introduced in the RDAs 6th revision.

include values for selected nutrients in the nutritional standards, based on the accumulation of new evidence from the scientific literature. Table 2 shows the historical changes to the established energy and nutrients that are included in the dietary recommendations in Japan by MHLW. Reference values for energy, protein, vitamin A, vitamin D, vitamin B_1, vitamin B_2, vitamin C, calcium and iron were included in all versions of the RDAs from the 1st to the current DRIs-J 2010. Although the 1st version of RDAs only included 10 nutrients (*2*), the current DRIs-J 2010 provides recommendations for 34 nutrients (*10*). Changes to nutrient reference values for the RDAs and DRIs-J are established based on changes in the health condition and/or dietary habits of Japanese at the time of revision. In particular, it was important that the nutritional problem in Japan expanded to include not only nutrient deficiency and improvement of physical strength but also excess and/or imbalanced consumption of energy and nutrients, lack of exercise, increase of overweight/obesity and chronic disease. In order to correspond to these problems, not only the results of an experimental studies but also epidemiological studies were added to evidence for DRIs-J creation.

Selection criteria for inclusion of nutrients in DRIs-J are 1) nutrients that are essential for life and the maintenance and/or improvement of health, and 2) nutrient intake values that are backed by scientific evidence or have achieved global consensus. Nutrient values that could not be established due to insufficient evidence are not included.

This paper describes an overview of the history and establishment of DRIs in Japan. Future revisions of DRIs-J must take into account the health condition and eating habits of Japanese in order to determine the kinds of nutrients that should be included.

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Table 2. Historical changes to the established energy and nutrients included in the Dietary Recommendations in Japan.

Versions		RDAs							DRIs-J	
		1st	1st revision	2nd revision	3rd revision	4th revision	5th revision	6th revision —DRIs—[1]	2005	2010
Energy		RDA	RDA	RDA	RDA	RDA	RDA	RDA	EER	EER
Protein		RDA	RDA	RDA	RDA	RDA	RDA	RDA	EAR, RDA, DG	EAR, RDA
Fat	Total fat	—	—	RDA	RDA	RDA	RDA	RDA	DG	DG
	Saturated fatty acids	—	—	—	—	—	—	—	DG	DG
	n-6 fatty acids	—	—	—	—	—	—	—	AI, DG	AI, DG
	n-3 fatty acids	—	—	—	—	—	—	—	AI, DG	AI, DG
	Cholesterol	—	—	—	—	—	—	—	DG	DG
Carbohydrates	Carbohydrates	—	—	—	—	—	—	—	DG	DG
	Dietary fibers	—	—	—	—	—	target amount	target amount	AI, DG	DG
Fat-soluble vitamins	Vitamin A	RDA	RDA	RDA	RDA	RDA	RDA	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Vitamin D	RDA	RDA	RDA	RDA	RDA	RDA	RDA, UL	AI, UL	AI, UL
	Vitamin E	—	—	—	—	target amount	target amount	RDA, UL	AI, UL	AI, UL
	Vitamin K	—	—	—	—	—	—	RDA, UL	AI	AI
Water-soluble vitamins	Vitamin B_1	RDA	RDA	RDA	RDA	RDA	RDA	RDA	EAR, RDA	EAR, RDA
	Vitamin B_2	RDA	RDA	RDA	RDA	RDA	RDA	RDA	EAR, RDA	EAR, RDA
	Niacin	RDA (nicotinic acid)	RDA (nicotinic acid)	RDA	RDA	RDA	RDA	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Vitamin B_6	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Vitamin B_{12}	—	—	—	—	—	—	RDA	EAR, RDA	EAR, RDA
	Folate	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Pantothenic acid	—	—	—	—	—	—	RDA	AI	AI
	Biotin	—	—	—	—	—	—	RDA	AI	AI
	Vitamin C	RDA	RDA	RDA	RDA	RDA	RDA	RDA	EAR, RDA	EAR, RDA
Macrominerals	Sodium	RDA (sodium chloride)	—	target amount	target amount	target amount	target amount	—	EAR, DG	EAR, DG
	Potassium	—	—	—	target amount	target amount	target amount	RDA	AI, DG	AI, DG
	Calcium	RDA	RDA	RDA	RDA	RDA	RDA	RDA, UL	AI, DG, UL	EAR, RDA, UL
	Magnesium	—	—	—	—	target amount	target amount	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Phosphorus	—	—	target amount	target amount	target amount	target amount	RDA, UL	AI, UL	AI, UL
Microminerals	Iron	RDA	RDA	RDA	RDA	RDA	RDA	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Zinc	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Copper	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Manganese	—	—	—	—	—	—	RDA, UL	AI, UL	AI, UL
	Iodine	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Selenium	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL
	Chromium	—	—	—	—	—	—	RDA, UL	EAR, RDA	EAR, RDA
	Molybdenum	—	—	—	—	—	—	RDA, UL	EAR, RDA, UL	EAR, RDA, UL

RDA, Recommended Dietary Allowance; DRIs-J, Dietary Reference Intakes for Japanese; EAR, estimated average requirement; AI, adequate intake; EER, estimated energy requirement; UL, tolerable upper intake level; DG, tentative dietary goal for preventing lifestyle-related diseases.
Persons≧1 y old.
[1] The concept of DRIs was introduced in the RDAs 6th revision.

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Dietary Reference Intakes for Japanese 2010: Basic Theories for the Development

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Summary The Dietary Reference Intakes for Japanese (DRIs-J) 2010 was developed to provide reference values for the intake of energy and 34 nutrients for health maintenance and promotion and primary prevention of lifestyle-related diseases in healthy individuals and groups. The DRIs-J 2010, which follows the main concepts of the DRIs-J 2005, the prior version, provides the values for energy requirements as expressed by the estimated energy requirement (EER) and the values for nutrient intake as expressed by 5, the estimated average requirement (EAR), recommended dietary allowance (RDA), adequate intake (AI), tolerable upper intake level (UL), and tentative dietary goal for preventing lifestyle-related diseases (DG). On account of 3 factors—optimal intake varies among individuals, intake cannot be measured precisely, and the DRIs are aimed at maintaining health and preventing disease over the long term rather than addressing acute health effects in the short term—the DRIs were determined using the probability approach to provide the appropriate values for habitual rather than short-term intake. Each value of the DRIs used in the DRI-J 2010 is provided for 13 age groups (the values for energy and protein are provided for 14 groups), with separate values provided for women who are pregnant or lactating and for men and women. The EER is provided for 3 physical activity levels and the EAR, RDA, AI, and UL for 19, 18, 10, and 16 nutrients, respectively. The basic concepts behind the DRIs-J 2010 are almost same as those behind the DRIs of the United States and Canada with the unique exception that the DRIs-J 2010 also includes the DGs, dietary goals that were independently determined after consideration of the average body size, disease prevalence, and dietary habits of the Japanese population and the cumulative evidence regarding Japanese and East Asian populations. The DRIs-J 2010 has been used in practice since 2010 and is expected to be used until 2014. This review briefly describes the basic theories in its development.

Key Words dietary reference intakes, development, theory, Japan

Introduction

Released every 5 y by the Ministry of Health, Labour, and Welfare of Japan, the Dietary Reference Intakes for Japanese (DRIs-J) are the core values used in developing national nutritional guidelines for the Japanese population. The most recent version, the DRIs-J 2010, contains practically the same values as those contained in the Report from the Expert Committee for "Dietary Reference Intakes for Japanese," which was released in 2009. Until fiscal year 2004, Japan had been using the recommended dietary allowance (RDA) as an index with some small modifications in accordance with changing needs in each period. In 2005, Japan began using the DRIs, as reflected in the development of the DRIs-J 2005, with which the DRIs-J 2010 largely accords. This review briefly describes the basic theories used in the development of the DRIs-J 2010, which is undoubtedly fundamental in understanding its proper use. This brief review consists of the following 3 sections: (1) the criteria used in the selection of nutrient and energy values, (2) the determination of the each of the DRIs and (3) the basic parameters used in designing the DRIs.

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Selection Criteria

The selection criteria for each nutrient included in the DRIs were the following: (1) the nutrient is essential for human life and the maintenance and improvement of health, (2) the required intake of the nutrient can be quantitatively defined, and (3) the required intake can be determined with a sufficient level of scientific reliability. Nutrients found to be closely associated with the development of lifestyle-related diseases in the Japanese population were also selected. Based on these criteria, 34 nutrients were selected for inclusion in the DRIs-J 2010. Energy was also included as an essential dietary factor for maintenance of human life. Quantitative values were established according to sex, age group, and pregnancy/lactation status.

Individual Values of the DRIs

1. Energy

For adults, a certain fixed energy intake is necessary to maintain body weight. Insufficient energy intake leads to weight loss, leanness, and protein–energy mal-