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Original Article

Application of food description to the food classification system: Evidence of risk assessment from Taiwan as Acrylamide of grain products

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ABSTRACT

Harmonization of national consumption data for international comparison is an important but challenging work, yet to date there is a lack of comparable food classification system that incorporates food description in Taiwan. In 2015, European Food Safety Authority (EFSA) released a new standardized food classification and description system called FoodEx2, which provides a flexible combination of classifications and descriptions. Based on FoodEx2 and a unique data set of daily food consumption offered by Taiwan Food Consumption Database, this study aims to provide a harmonized, food description incorporated, food classification system (HFDFC system) that captures all the useful details of food groups in exposure assessments. The HFDFC system was built according to six risk-assessment-related facets including food sources, processed products, cooking methods, manufacturers (brand), food additives and specialty foods. The HFDFC system includes 199 foods in the core list and 131 foods in the extended list. This study also compared the Acrylamide hazard index estimated under the HFDFC system with that under the National Food Consumption Database in Taiwan (NFCDT). The findings indicated that the HFDFC system provides useful and detailed information that helps the users to quickly identify food information in a harmonized manner and to reduce estimation bias. The HFDFC system is expected to facilitate global comparisons in the food risk assessment because it is built based upon EU Foodex2.

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1. Introduction

There have been a growing number of food risk assessment research in Taiwan, for example, aluminum exposure of candies [1], dioxin exposure of food [2]. Food classification system plays an important role in the risk assessment of food safety and health worldwide. A good food classification system shall fulfill its users by providing information in a timely and efficient manner. A prominent example in Taiwan is the edible oil scandal. In September 2014, a large edible oil producer was discovered selling contaminated cooking oil. When investigators accessed the food classification system for risk assessment, they found that the database only provides total intakes of fats and oils and that there is a lack of edible oil dietary consumption data classified according to the brand name of edible oil products. Another example is Acrylamide risk assessment. Acrylamide risk assessment has gaining its importance in recent years. Acrylamide, commonly contained in fried, grilled, or baked foods containing carbohydrates, is listed by the International Cancer Research Institute (IARC) as Group 2A carcinogens [3]. However, the food classification system fails to provide dietary consumption data in terms of cooking methods, which could result in biased results in the Acrylamide risk assessment. To illustrate, a chicken thigh itself is not carcinogenic, but a roasted chicken thigh raises cancer risk. If the description of the food classification system is standardized in terms of cooking method, e.g. roast, it will help the users to focus on the dietary consumption of roasted chicken thighs in their risk assessment. This may further affect the accuracy of findings. Yet to date there is a lack of standardized food classification system that incorporates appropriate food description in Taiwan.

We fill the gap by providing a harmonized, food description incorporated, food classification system (hereafter, HFDFC system) that involves useful details of food groups in the Acrylamide risk assessments under the framework of FoodEx2. FoodEx2 is a new standardized food classification and description system released by the European Food Safety Authority (EFSA) in 2015 [4]. The system encompasses 32 facets that describe food properties and aspects from various perspectives, which helps its user conveniently to compare food consumption data from different sources. We expect the new HFDFC system provides better information for the users in the Acrylamide risk assessments.

2. Methods

2.1. Food description and classification systems

There are a variety of food description systems around the world, such as INFIC/ENFIC System, INFOODS Nomenclature System, and AGROVOC thesaurus [5–8]. The most popular standardized food description system called LanguaL™ was developed by the United States Food and Drug Administration (FDA) in the late 1970's. This system was further administered by the European LanguaL™ Technical Committee in 1996. LanguaL™ included 75,000 descriptions and 14 facets for users [9,10]. To facilitate the use of the standardized food description system in the food risk assessment, EFSA developed a food classification and description system for exposure assessment called FoodEx in 2011, which included 25 facets that describe food properties and aspects from various perspectives. In 2015, EFSA expended the system to 32 facets, called FoodEx2 [4,11,12]. In Europe, the FoodEx2 includes food consumption data coming from 22 different national dietary surveys in the 20 Member States [11]. FoodEx2 is also used by a well-known food-searching engine called the Ontology-Driven Mobile Safe Food Consumption System (FoodWiki), which provides food consumption suggestions to consumers who want to know more detail about the food product [13].

In Taiwan, there are mainly three popular food classification systems. Nutrient Composition Data Bank for Foods (NCDBF) is the food classification systems provided by Taiwan Food and Drug Administration (TFDA), which encompasses 18 level-one food groups including mixed grains, starch products, dry beans and nuts, fruit products, vegetable products, alga products, mushroom products, bean products, meat products, fish and shellfish products, egg products, milks products, oil products, sugar products, drinks, seasonings and spices, cakes and snacks, and seasoning packs [14]. Nutrition and Health Survey in Taiwan (NAHSIT) is maintained by Taiwan Health Promotion Administration, which provides 12 level-one food groups including (1) cereals, grains, tubers and roots; (2) fats and oils; (3) poultry; (4) meat; (5) seafood; (6) other protein-rich foods; (7) vegetables; (8) fruits; (9) refreshment and snakes; (10) alcoholic beverages; (11) sauces, condiments and spices; (12) miscellaneous foods, and also provides 48 level-two sub-groups [15]. National Food Consumption Database in Taiwan (NFCDT) is maintained by TFDA, which provides 17 level-one food groups including (1) wholegrain and mixed grains; (2) dry beans and nuts; (3) fats and oils; (4) poultry and poultry products; (5) livestock and livestock products; (6) fish, seafood; (7) eggs; (8) dairy; (9) fruits; (10) vegetables; (11) sugar and confections; (12) drinks; (13) wine; (14) seasonings; (15) composite food, soups and other categories; (16) infant foods; (17) health foods. It also includes 67 level-two sub-groups, 199 level-three sub-groups, and 131 level-four sub-groups [16]. The NFCDT only provides consumption data in terms of food name for risk assessment, and it does not provide detailed information such as brand name, cooking methods, etc. The use of NFCDT in the risk assessment is limited because the users cannot distinguish different cooking methods from food consumption data.

2.2. Research framework

Fig. 1 outlines how we shape the HFDFC system. We initiated building the food information by constructing food description facets in terms of the dietary consumption data retrieved from NAHSIT, following the process of food description construction in the EFSA. In 2015, our working group discussed with TFDA regarding the food messages available from the NAHSIT diet database. TFDA and our working group reached a consistency regarding three types of food information: (1) Food description for the nutritional information that is sufficient to provide basic food information. (2) Information about food additives in the food safety events. (3) Food information for risk assessment. We then built the HFDFC system by classifying the facets

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