Food and Chemical Toxicology 104 (2017) 79–84

Contents lists available at ScienceDirect

Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

Health risk/benefit information for consumers of fish and shellfish: FishChoice, a new online tool

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ARTICLE INFO

Article history:
Received 25 August 2016
Received in revised form
27 January 2017
Accepted 2 February 2017
Available online 5 February 2017

Keywords:
Fish and shellfish
Emerging pollutants
Health risks
Health benefits
Online tools

ABSTRACT

It is well known that due to the content in omega-3 fatty acids, consumption of fish and shellfish is beneficial for human cardiovascular health. However, a number of recent studies have shown that fish consumption may be also a potential dietary source of exposure to various environmental pollutants with well-known potential adverse effects on human health. Moreover, there is still a lack of information regarding levels of emerging contaminants in fish and shellfish, in particular among consumers and stakeholders. Within the ECsafeSEAFOOD FP7 project, a wide variety of emerging contaminants including brominated flame retardants, pharmaceuticals, perfluoroalkyl substances, musk fragrances, polycyclic aromatic hydrocarbons, UV-filters and endocrine disruptors, as well as inorganic arsenic and methylmercury, were analyzed in fish and shellfish samples collected all over the European Union. These data, together with those regarding nutrient concentrations from different European food composition databases, were integrated into a new online tool, called FishChoice. In this paper, we report how FishChoice was designed and present its main improvements compared to previous tools or software programs, in terms of selected pollutants, number of species, and specific recommendations for an optimal consumption of fish and shellfish.

1. Introduction

In recent decades, the importance of fish and shellfish as part of a healthy diet has meant an important promotion of their consumption among the general population. Fish and shellfish species are an important source of nutrients such as proteins, lipids, omega-3 polyunsaturated fatty acids (n-3 PUFAs), vitamins and minerals (Domingo et al., 2007a; Matos et al., 2015). The World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United Nations (UN) recommend a regular fish consumption of 1–2 servings per week in order to provide an equivalent of 200–500 mg of n-3 PUFAs, namely eicosapentaenoic (EPA) and docosahexaenoic acids (DHA) (FAO/WHO, 2011). Furthermore, a diet including a high consumption of fish and shellfish reduces the risks of cardiovascular diseases (CVD), mainly due to the beneficial effects of the n-3 PUFAs, EPA and DHA (Tediosi et al., 2015). However, a number of studies have also shown that fish and shellfish consumption can simultaneously be a dietary source of various environmental pollutants, which have well-known adverse effects on human health (Vandermeersch et al., 2015; Domingo, 2016). According to Frewer et al. (2016), there has been a considerable focus on fish or seafood as a product category in food risk/benefit communication studies, possibly owing to this controversy associated with health benefits from nutrients versus health risks from potential contaminants.

Meanwhile, it has been repeatedly shown that consumers and stakeholders flag specific information needs and expectations regarding the communication of risks and benefits from seafood consumption. van Dijk et al. (2012) reported that consumers perceived food-related risk/benefit information often as

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http://dx.doi.org/10.1016/j.fct.2017.02.004
0278-6915/

asymmetrical, confusing and not truthful. Their study participants also expressed a preference for more balanced and scientifically derived information. In addition, Pieniak et al. (2007) and Altintzoglou and Nostvold (2014) identified seafood consumer segments with differentiated information needs in relation to seafood consumption. The largest segments in both studies (referred to as "Enthusiasts" and "Info seekers", respectively, in those two studies) consisted of consumers who reported a strong need for more trustworthy, simple and easily accessible information about seafood. This type of evidence underscores the potential interest among consumers in having access to specific seafood-related information. Furthermore, Tediosi et al. (2015) have shown that also a wide diversity of stakeholders from policy, industry, and non-governmental organizations flagged a deficit of information and data in the field of seafood safety. Meanwhile, the stakeholders who participated in that study perceived online tools to be most useful as communication tools in this respect.

Already back in 2006, we launched RIBEPEIX (Domingo et al., 2007b), a simple computer program focused on quantitatively establishing the intake of a number of chemical pollutants versus that of EPA and DHA, whose consistent consumption is related to an improved cardiovascular risk, especially in high risk patients and populations (Colussi et al., 2014). RIBEPEIX was a basic Microsoft Access-based application containing data on the levels of cadmium, mercury, lead, polychlorinated dibenzo-*p*-dioxins and furans (PCDD/Fs), polychlorinated biphenyls (PCBs), hexachlorobenzene, polycyclic aromatic hydrocarbons (PAHs), polychlorinated naphthalenes (PCNs), polybrominated diphenyl ethers (PCDEs), and polychlorinated diphenyl ethers (PCDEs), as well as EPA and DHA, in 14 edible marine species.

Ten years later, a new online tool, FishChoice, has been launched in order to solve some limitations of RIBEPEIX. The new software, which has been designed in a friendlier graphical interface, has been developed in the framework of the European Union (EU) FP7-funded project ECsafeSEAFOOD. This project aimed at assessing food safety issues related to priority contaminants contained in fish and shellfish, as result of environmental contamination, as well as to evaluate their impact on public health.

2. Design and functionality: the FishChoice layout

FishChoice is based on the popular WordPress Content Management System (CMS), with the plugin acting on its codex. This enables a responsive interface on any display device and constant updates to prevent security problems. Furthermore, there is a whole community behind, constantly updated to ensure that the system adapts to the changes in Internet. Updated data regarding the concentration of a wide range of emerging pollutants, as well as those of nutrients in different edible marine species, were introduced. Two versions of FishChoice have been developed: a simple version for the general public, and a more extended (Pro) version for health professionals. Both of them are available at www.fishchoice.eu. This online tool has been structured in several screens to which the users can go while browsing.

2.1. Main screen

The calculator tab is positioned at the top left of the first screen. When starting, a specific profile can be selected. Different profiles were created according to age and gender: children (3–9 yr), boys (10–19 yr), girls (10–19 yr), men (20–65 yr), women (20–65 yr), pregnant or nursing women, senior males (>65 yr), and senior females (>65 yr). The average body weights assigned to each profile were 24, 56, 53, 70, 55, 55, 65 and 60 kg, respectively. Afterwards, the users can choose each one of the fish and shellfish species included in FishChoice, enter their weekly frequency of consumption, as well as their common portion sizes. Since in some cases this can be a difficult task for users, three pictures corresponding to three different portion sizes are depicted for each species (see an example in Fig. 1). Once the users have entered their fish and

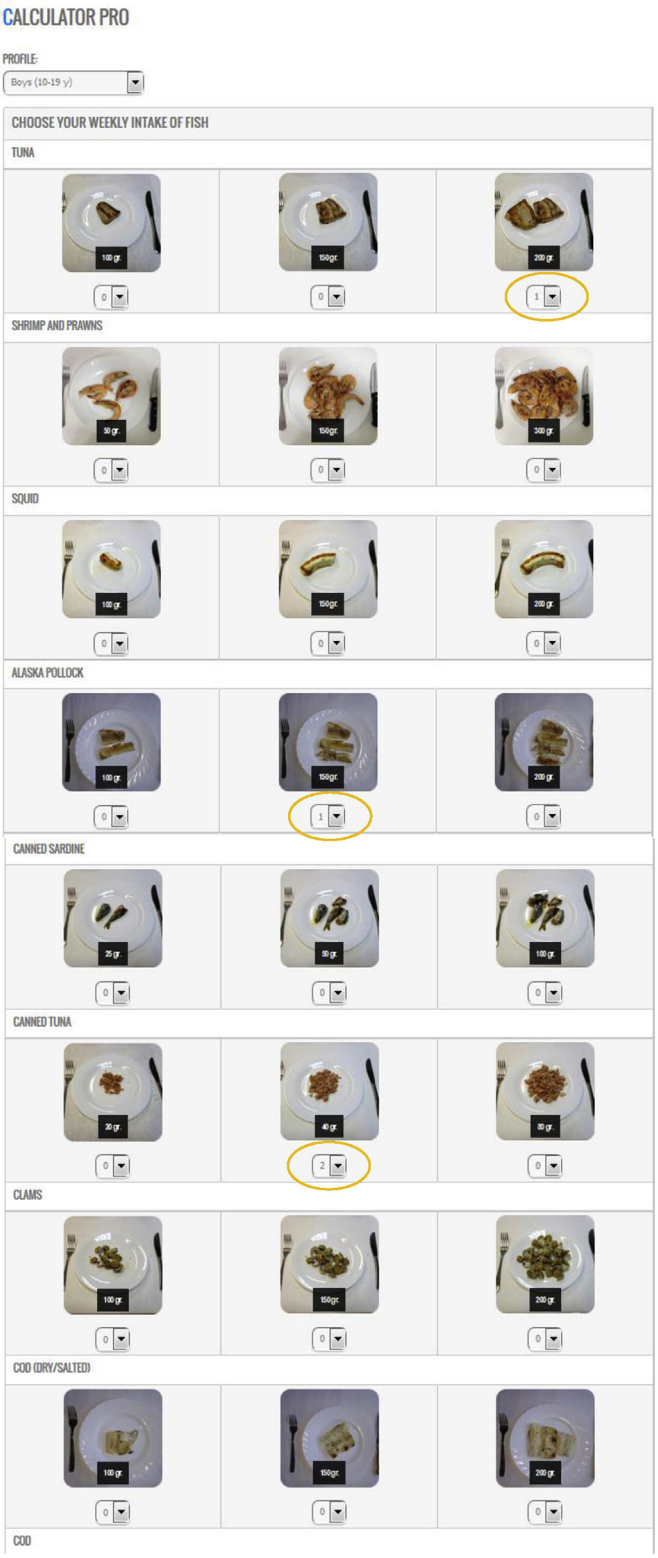

Fig. 1. Data on weekly fish and shellfish intake habits for a boy aged 10–19 yr, as an example.