Construction of a knowledge graph for food health claims

Remzi Celebi[1], Ilse van Lier[2], Alie de Boer[2] and Michel Dumontier[1]

[1]*Institute of Data Science, Faculty of Science and Engineering, Maastricht University, the Netherlands*
[2]*Food Claims Centre Venlo, Campus Venlo, Faculty of Science and Engineering, Maastricht University, the Netherlands*

Abstract

Authorised health claims and their scientific opinions offer valuable insights into health effects of foods and food ingredients. However, these texts are highly technical and not easily usable to those interested in the development and use of healthy food products and diets. In this paper, we present our effort to develop a knowledge graph that was curated from the information of 260 authorised health claims. The knowledge graph, based on data from scientific opinions, is subdivided into four ontological dimensions: the food (ingredient); the health effect; the target group; and the scientific evidence underlying the cause-and-effect relationship. Various differences were found between authorised claims and their underlying scientific opinions. These findings underline the need for further structuring the approach to substantiating and assessing health claims. Most importantly however, the development of this knowledge graph allows consumers, food producers and health care professionals to make personalised decisions in selecting healthy nutrition.

Keywords

personalised nutrition, food health claim, knowledge graphs, FAIR data

1. Method

We have developed an ontology that reflect the wealth of information found in EFSA's scientific opinions on health claims[1], including the specific nutrients or bioactive ingredients, the health relationships and biomarkers, the conditions of use for such a claim (e.g. the population that is referred to in the claim) and the supportive evidence underlying these claims.

To build this ontology, we have reviewed all EU authorised health claims and their underlying scientific opinions. These opinions detail the active substances (foods or food ingredients), the beneficial effects as well as the relevant evidence substantiating the relationship between ingredient and its effect. We have extracted these information manually from all scientific opinions regarding the authorized claims in the Register. This resulted in the inclusion of 260 claims and their scientific opinions: the scientific substantiation and conditions of use of 235 authorised function claims (229 based on generally accepted scientific evidence and six based

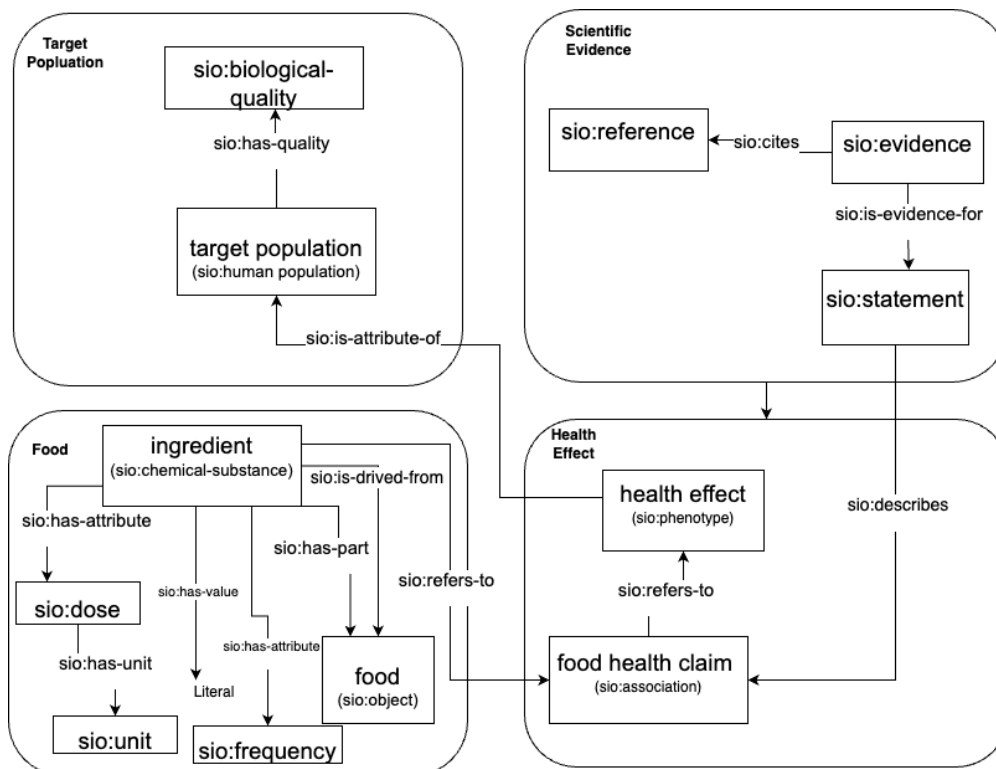[1]https://ec.europa.eu/food/food-feed-portal/screen/health-claims/eu-register

Figure 1: The proposed ontology based the Semanticscience Integrated Ontology (SIO) for food health claims.

The proposed data model for food health claim has four dimensions: Scientific Evidence, Food, Health Effect and Target Population. Each dimension is represented by our proposed ontology based on Semanticscience Integrated Ontology (SIO) and an existing vocabulary.

on newly developed evidence), 13 disease risk reduction claims and 12 claims on children's development and health.

Our ontology has four sub-structures in order to better explain different dimensions of health claims, as shown in Figure 1. These relate to the steps taken in assessing scientific dossiers for health claim authorisations the food or active ingredient itself (here labelled as Food), the beneficial physiological effect (Health Effect), the potential target group for this beneficial physiological effect (Target Population) and finally, the scientific evidence that is supports the association between consuming the ingredient and the suggested beneficial physiological effect (Scientific Evidence).

Acknowledgments