PERSPECTIVES AND CHALLEGES IN THE SAFETY ASSESSMENT OF ALTERNATIVE PROTEINS AND THEIR SOURCES AS NOVEL FOODS

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INTRODUCTION

Nowadays, due to the scarcity of natural sources and the high demand for protein foods from the growing world population, the need for more sustainable and accessible food and feed production has become a central policy issue the world over, including in the European Union (EU). In this regard, an increasing number of alternative proteins from several sources (i.e. minor plants, seeds, grains, algae and insects) and produced with novel technologies (such as extraction and isolation methods, 3D food printing and nanotechnologies) 1have been entering the EU market in recent years. However, alternative proteins may fall within the scope of the Novel Food Regulation (EU) 2015/2283, meaning their safety has to be proven before EU market authorisation by risk managers. In the EU, the European Food Safety Authority (EFSA) is the entity responsible for assessing the safety of Novel Foods (NFs) for consumers, upon request of the European Commission. The aim of this project is therefore to provide an overview of the safety assessment development needs, challenges and future perspectives related to alternative proteins and their sources as NFs from the EFSA's perspective.

METHODOLOGY

To this end, a comprehensive review of the alternative proteins and their sources as NFs was carried out from published and ongoing EFSA opinions using the Open EFSA portal. In addition, the risk assessment development needs, challenges, and future perspectives related to these novel proteins, their sources and related production process were investigated by means of a literature review.

RESULTS

Most alternative proteins are derived from plants and their constituent parts, such as seeds (e.g. peas and mung beans), cereal grains (e.g. intermediate wheatgrass), mixtures of cereals and pulses (e.g. rice and peas), and leaves (e.g. beet leaves). Moreover, insects such

as mealworms, grasshoppers and house crickets, as well as algae (e.g. for macroalgae: Laminaria digitata; for microalgae: Galdieria sulphuraria, Schizochytrium sp., Phaeodactylum tricornutum, Tetraselmis chuii), are among the sources often utilised. An additional and quite recent class of alternative proteins and products thereof (e.g. peptides) concerns industry by-products that may derive from various sources, including rapeseed, barley or milk. All these alternative proteins could be proposed as whole foods (e.g. seeds) or food ingredients (e.g. powders, concentrates, isolates and hydrolysates). As regards technologies, these include both methods for extracting and isolating proteins, and processes aimed at improving their nutritional quality and safety, such as thermal, fermentation or enzymatic hydrolysis treatments.

DISCUSSION

These alternative proteins are frequently complex matrices for which a thorough chemical and nutritional characterisation is needed, including the assessment of parameters such as anti-nutritional compounds, toxicants, allergens and undesirable substances linked to the production process. Furthermore, an increased level of processing may trigger additional requirements during the safety assessment. In particular, the allergenicity assessment of alternative proteins proves to be quite challenging due to the lack of information in the literature (study reports, scientific papers, etc.) and the lack of validated methods – a different scenario compared to the toxicity assessment, where well-validated *in vitro* and *in vivo* models have been in use for years. Hence, there is a need for development of novel approaches for the safety assessment of these proteins that can more efficiently integrate innovative tools and up to date information.