EDITORIAL

Allergens associated with edible insects unlikely to cause adverse health effects to consumers

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1.0 Introduction

Insects represent a significant part of the diet for many communities and are delicacy in several countries in Africa, South America, Asia and Oceania. However, in western countries, the consumption of insects (entomophagy) is yet to be culturally and socially accepted (Orsi *et al*., 2019). Currently, more than 2,000 documented arthropods are being eaten worldwide (Kelemu *et al.*, 2015). From a nutritional point of view, insects have an interesting nutritional profile, offering important sources of vitamins, minerals and animal-derived proteins. They also require less feed for each kg of food produced, and have higher relative growth and lower emission of greenhouse gases compared to livestock (Oonincx *et al*., 2010). Thus, considering their efficiency, edible insects could play an important role to meet the increasing demand for food, in particular as an important source of animal protein.

Little is known on the food safety aspects of edible insects and this could be of critical importance to meet the society's approval, especially if people are not accustomed to eating insects. Food allergy is an adverse immune response to food, which is caused by substances called allergens (type of antigens), which can result to a serious illness and sometimes death (Imathiu, 2020). Globally, food allergy is an emerging public health problem whose management along the food value chain continues to pose great challenge to the industry and professional health care practitioners. A wide range of foods containing protein can cause allergic reactions to sensitive people (Murefu *et al*., 2019).

2.0 Edible insect allergens

Just like vertebrates, safety concerns associated with the consumption of edible insects, such as chemical and allergenic agents, can present a health threat to consumers. Since edible insects contains great amount of protein, it is possible that some insects and insect-derived foods are potential allergen sources. Some specific proteins present in edible insect including arginine kinase, α-amylase and tropomyosin are considered potential allergens (Murefu *et al*., 2019). In addition, the fact that insects are also related to crustaceans, there is potential for them to cause food related allergies to consumers.

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To date, only few studies have been published on allergic reactions due to insect consumption. Most of the research in regard to insect allergy focusses on inhalation insect allergy and insect venom allergy with little effort directed towards allergenicity in terms of food safety (Murefu et al., 2019). In developed countries, edible insects are considered 'novel' food, and thus, it is important to determine their potential hazards and risks including their allergenicity. Although 0.1 to 5.7% of European adults have food allergies (Nwaru *et al*., 2014), a study carried out in Belgium revealed that about 19% of persons were sensitized by skin prick tests prepared with grilled *Acheta domesticus* and *Tenebrio molitor* insect samples (Francis et al., 2019), suggesting there is potential risk of developing allergic reactions to insects' consumers. A study carried out in Thailand revealed few cases of allergenicity related to cricket and grasshopper consumption but could not identify the species responsible for the allergic reaction (Piromrat et al., 2008). However, it has been demonstrated that allergic reactions induced by grasshoppers are more common than those induced by crickets (Ji *et al*., 2009). In China, silkworm pupa is the most commonly consumed insect type, and it is estimated that at least one thousand of the consumer's experience mild allergic reactions with only a few of the consumers requiring hospitalization (Ji *et al*., 2008). Other studies revealed that only 7.6% of insects' consumers in Laos exhibited mild allergic reactions (Murefu *et al*., 2019), while other few insect food allergy has been reported for mealworm, silkworm, sago worms, caterpillars, grasshopper, locust, bee, cicada, *Bruchus lentis* and *Clanis bilineata* (Murefu *et al*., 2019); and in locusts and grasshoppers in India, and mopane cartapillars (*Imbrasia belina*) in Africa (Imathiu, 2020).

Generally, only few cases of mild allergic reactions have been reported in some parts of the world where entomophagy has been practiced for decades. Ironically, most these mild cases of insect food allergies reported are from developed countries where edible insects are considered 'novel food' as opposed to developing countries where they are largely consumed. Nevertheless, with edible insects considered as food for the future, there is a potential for their increased consumption with the possibility of increasing insect food allergy prevalence particularly in developing countries. Thus, the potential for insects and insect-based products to cause allergenicity to consumers need to be established through further research.

3.0 References

Francis, F., Doyen, V., Debaugnies, F., Mazzucchelli, G., Caparros, R., Alabi, T., & Corazza, F. (2019). Limited cross reactivity among arginine kinase allergens from mealworm and cricket edible insects. *Food chemistry*, *276*, 714-718.

Ji, K., Chen, J., Li, M., Liu, Z., Wang, C., Zhan, Z., & Xia, Q. (2009). Anaphylactic shock and lethal anaphylaxis caused by food consumption in China. *Trends in food science & technology*, *20*(5), 227-231.

Imathiu, S. (2020). Benefits and food safety concerns associated with consumption of edible insects. *NFS Journal*, *18*, 1–11. https://doi.org/10.1016/j.nfs.2019.11.002

Kelemu, S., Niassy, S., Torto, B., Fiaboe, K., Affognon, H., Tonnang, H., Maniania, N. K., & Ekesi, S. (2015). African edible insects for food and feed: inventory, diversity, commonalities and contribution to food security. *Journal of Insects as Food and Feed*, *1*(2), 103–119.

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https://doi.org/10.3920/JIFF2014.0016

Murefu, T. R., Macheka, L., Musundire, R., & Manditsera, F. A. (2019). Safety of wild harvested and reared edible insects: A review. *Food Control*, *101*, 209–224. https://doi.org/10.1016/j.foodcont.2019.03.003

Nwaru, B. I., Hickstein, L., Panesar, S. S., Roberts, G., Muraro, A., Sheikh, A., and EAACI Food Allergy and Anaphylaxis Guidelines Group. (2014). Prevalence of common food allergies in Europe: a systematic review and meta-analysis. *Allergy*, *69*(8), 992-1007.

Oonincx, D. G. A. B., van Itterbeeck, J., Heetkamp, M. J. W., van den Brand, H., van Loon, J. J. A., & van Huis, A. (2010). An exploration on greenhouse gas and ammonia production by insect species suitable for animal or human consumption. *PLoS ONE*, *5*(12), 1–7. https://doi.org/10.1371/journal.pone.0014445

Orsi, L., Voege, L. L., & Stranieri, S. (2019). Eating edible insects as sustainable food? Exploring the determinants of consumer acceptance in Germany. *Food Research International*, *125*(April), 108573. https://doi.org/10.1016/j.foodres.2019.108573

Piromrat, K., Chinratanapisit, S., & Trathong, S. (2008). Anaphylaxis in an emergency department: a 2-year study in a tertiary-care hospital. *Asian Pacific Journal of Allergy and Immunology*, *26*(2-3), 121.

URL: https://ojs.jkuat.ac.ke/index.php/JAGST
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