

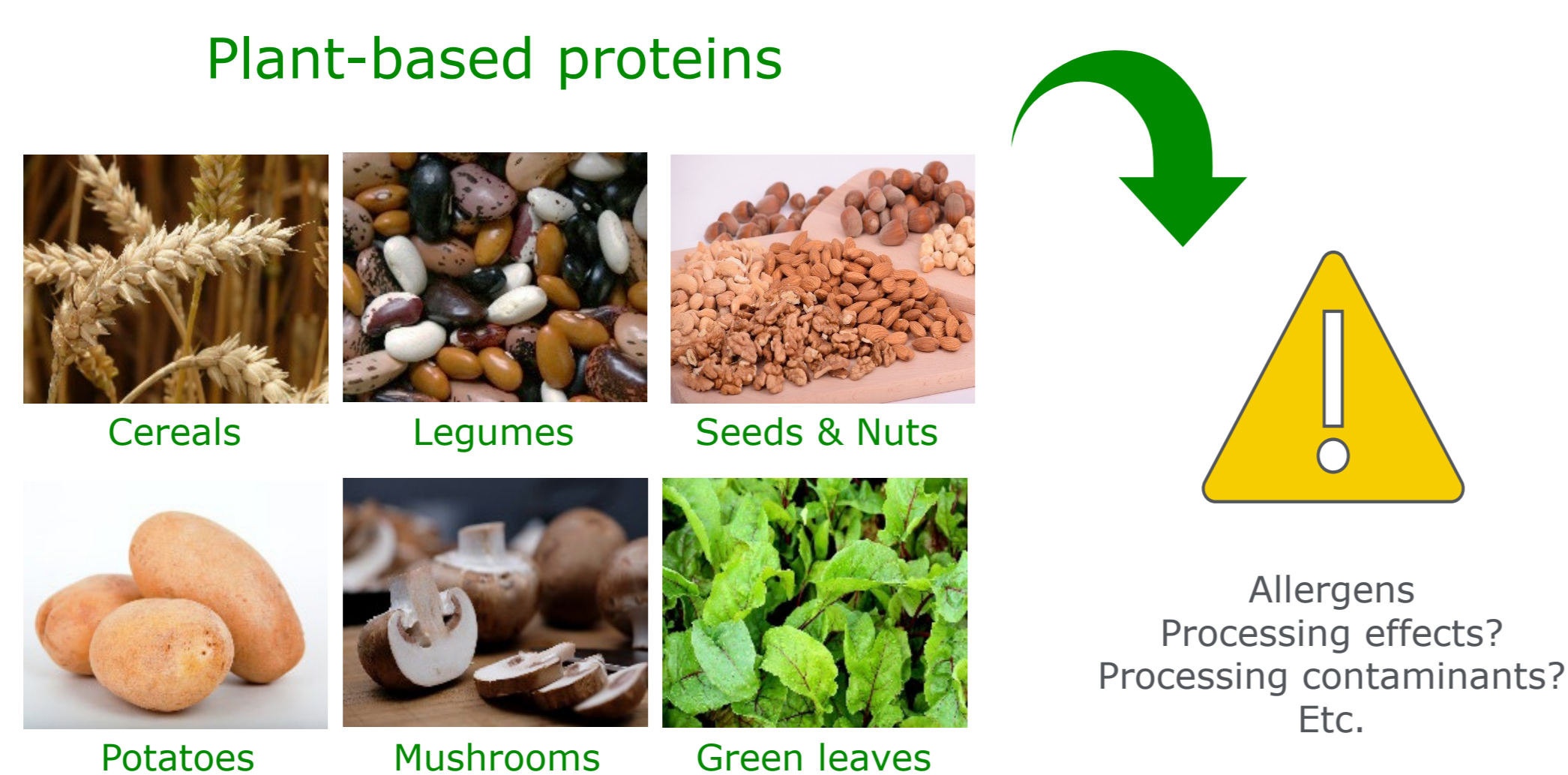


Food safety hazards related to plant-based proteins used as alternatives to meat and dairy products

J.L. Banach and E.D. van Asselt

At a glance

Understanding the processing effects and safety of plant-based proteins is essential to ensuring food safety and understanding the risks.



Background

Meat and dairy products are traditionally seen as important protein sources for the human diet. However, consumer trends and circular agriculture have increased demands for plant-based proteins and a need for a different use or reuse of proteins. As a result, new plant-based protein sources will be used in the food chain. Along with beneficial effects, such a protein transition can result in the emergence of food safety hazards.

Objective

To identify chemical food safety hazards related to the protein transition using literature review and expert interviews. Given their increasing use, the focus is on plant-based proteins: cereals, legumes, seeds, nuts, potatoes, mushrooms, and green leaves.

Introduction

In the European food industry, barriers influencing the growth of the plant-based sector are bridging the price gap between animal and plant-based products, improving user experiences regarding taste and nutritional profiles, and increasing the distribution and availability of plant-based products [1]. Figure 1 shows the sharp increase in plant-based alternatives and growing interest in protein alternatives. The global market for plant-based proteins is forecasted to continue growing, with an estimated turnover of 27 billion dollars by 2030 [2].

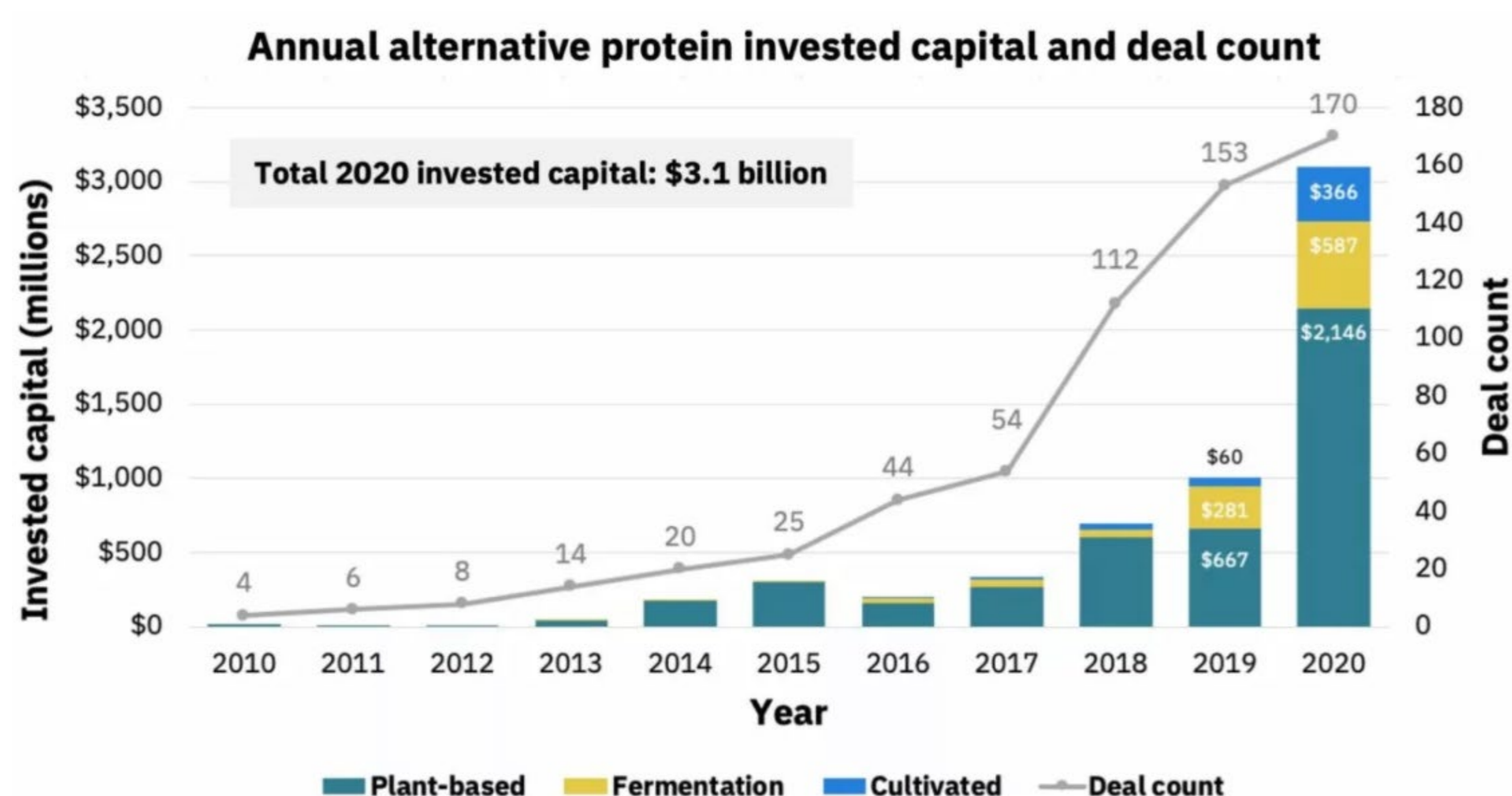


Figure 1. Annual alternative protein investment backdrop from 2010-2020. Source: [3] The Good Food Institute (2021).

Results

- The known effects of processing on food safety hazards are limited.
- Allergens, anti-nutritional factors, plant protection products and biocides, and processing contaminants are hazards potentially relevant for all plant-based proteins (Table 1).

Table 1. Overview of potential chemical hazards in plant-based proteins, based on literature and expert opinion.

Hazards	Cereals	Legumes	Seeds	Nuts	Potatoes	Mushrooms	Green leaves
Allergens	x	x	x	x	x ³	x ²	x ²
Anti-nutritional factors	x ¹	x	x ¹	x ¹	x ¹	x ¹	x ¹
Brominated flame retardants	-	-	-	-	-	-	-
Dioxins and polychlorinated biphenyls	-	-	-	-	-	-	-
Elements	x ²	x	x ²	x ²	-	x	-
Heavy metals	x ²	x	-	-	x	x	x
Marine biotoxins	-	-	-	-	-	-	-
Mycotoxins	x ²	x	x ²	x ²	x ²	-	-
Plant protection products and biocides	x	x	x ²	x	x	x	x
Plant toxins or compounds	-	x	x	x	x ²	-	x
Polycyclic aromatic hydrocarbons	x	-	x ²	-	-	-	x
Processing contaminants	x ¹	x ¹	x ¹	x ¹	x	x ¹	x
Veterinary drug residues	-	-	-	-	-	-	-

Dash: no indications were found that this would be a potential hazard.

¹ Mentioned as a general, potential hazard in plant-based proteins.

² Knowledge gaps of some hazards within this hazard group.

³ Rarely occurs.

Conclusions

- Plant-based proteins are increasingly used globally.
- Typical food safety hazards related to the plant, product itself, or processing are relevant to monitor in meat and dairy replacers.
- Therefore, evaluating hazards related to plant-based proteins should take precedence in national monitoring programs.
- Data on the effects of processing on hazards is limited.
- We should further explore trends towards other upcoming alternative protein sources and the effects of processing on food safety.

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References

- [1] Geijer & Gammoudy. (2020). Growth of meat and dairy alternatives is stirring up the European food industry.
 [2] P&S Intelligence. (2021). Plant-based protein market to be \$26,721.3 million by 2030, says P&S Intelligence.
 [3] The Good Food Institute (2021). 2020 State of the Industry Report. Plant-based Meat, Eggs, and Dairy.

