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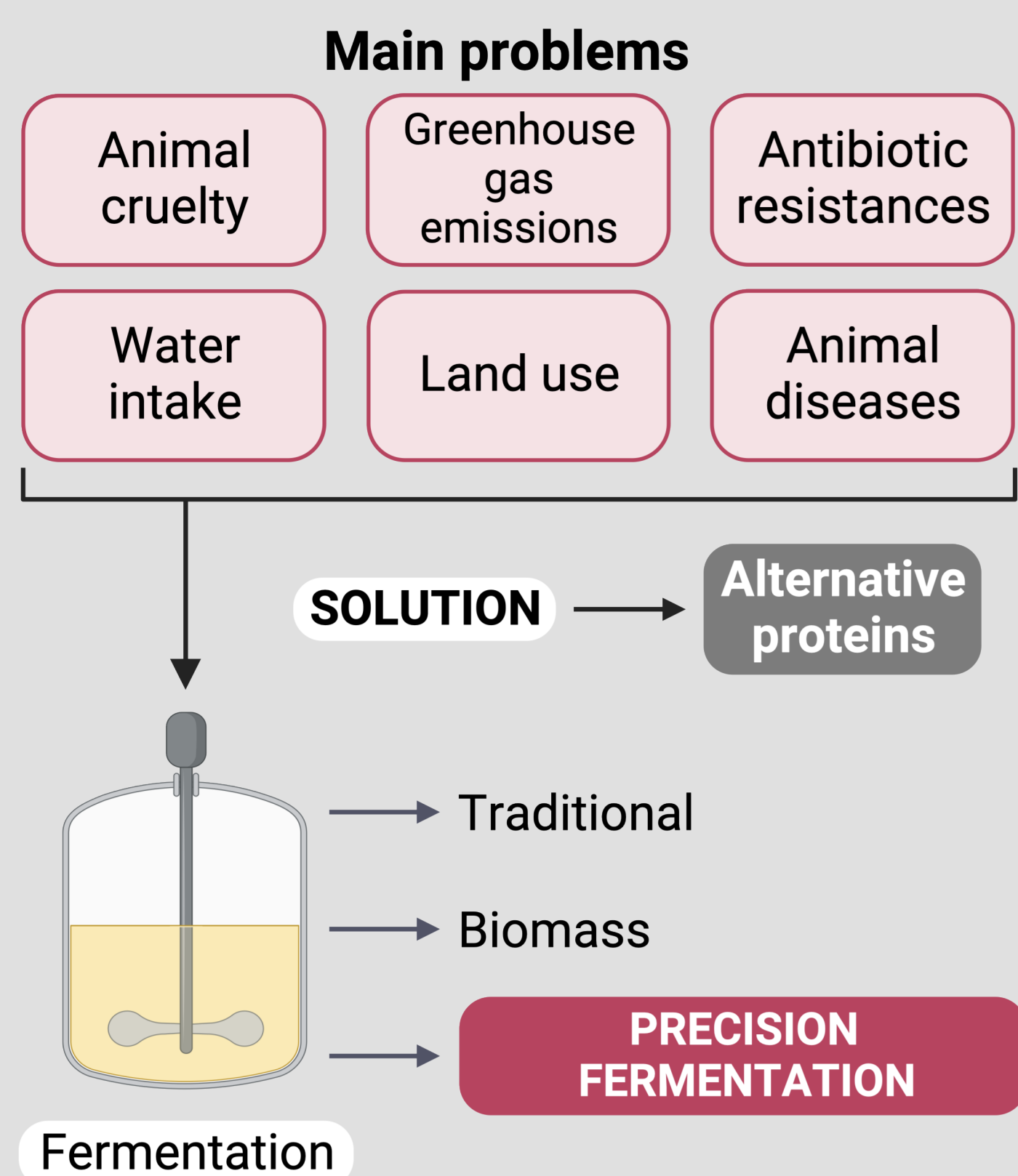
ABSTRACT

Consumers are increasingly concerned about the impact of the foods they integrate into their diet. The intensive production of plant and animal-based foods causes environmental and ethical issues. To face this problem, the biotechnology industry is developing new production systems, supported by advances in molecular biology and the demand of consumers committed to sustainability. Precision fermentation is a technique that can reduce the production of conventional proteins by using microorganisms to produce molecules such as proteins, enzymes, and colorants.

METHODOLOGY

A bibliographic research was made mainly in scientific review articles, where the situation of these new production systems was discussed, in which an overview of this technology and its advantages were provided. To obtain information on the market or regulatory aspects, grey literature was searched, such as patents, annual reports, news, and governmental organizations webs.

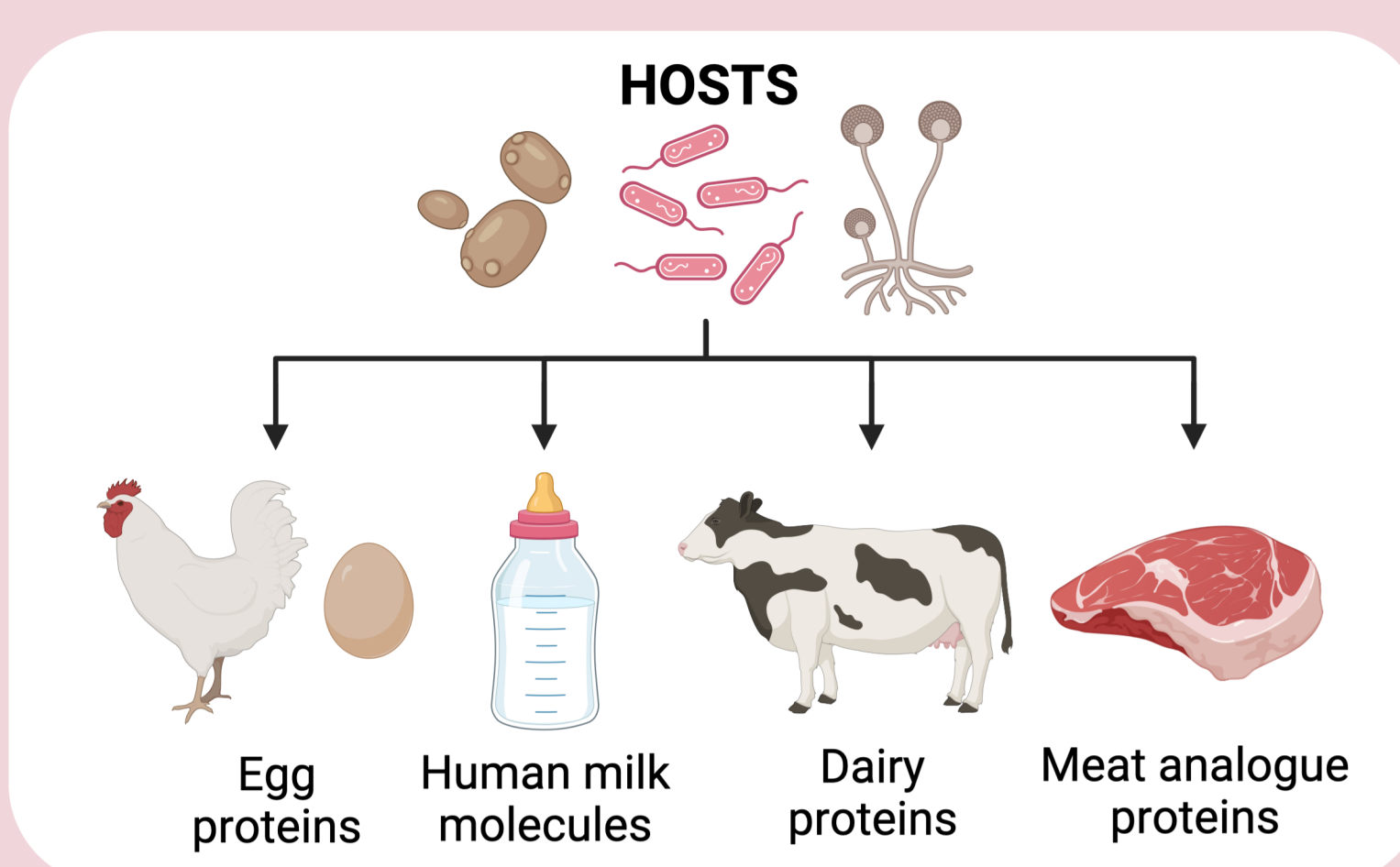
Conventional Food Production



Fermentation is presented as a solution to replace conventional protein production. We can distinguish traditional fermentation, biomass fermentation and precision fermentation, using all of them we can obtain alternative proteins.

What is Precision Fermentation?

Proteins obtained by precision fermentation are considered alternative proteins. With this method, proteins are produced heterologously by microorganisms, to which the gene coding for the protein of interest has been inserted. These proteins can range from hen egg proteins to milk proteins, and have exactly the same nutritional and physicochemical characteristics as the original ones.



For the manufacturing of products with food applications, hosts with **GRAS** (Generally Recognized As Safe) status are chosen.

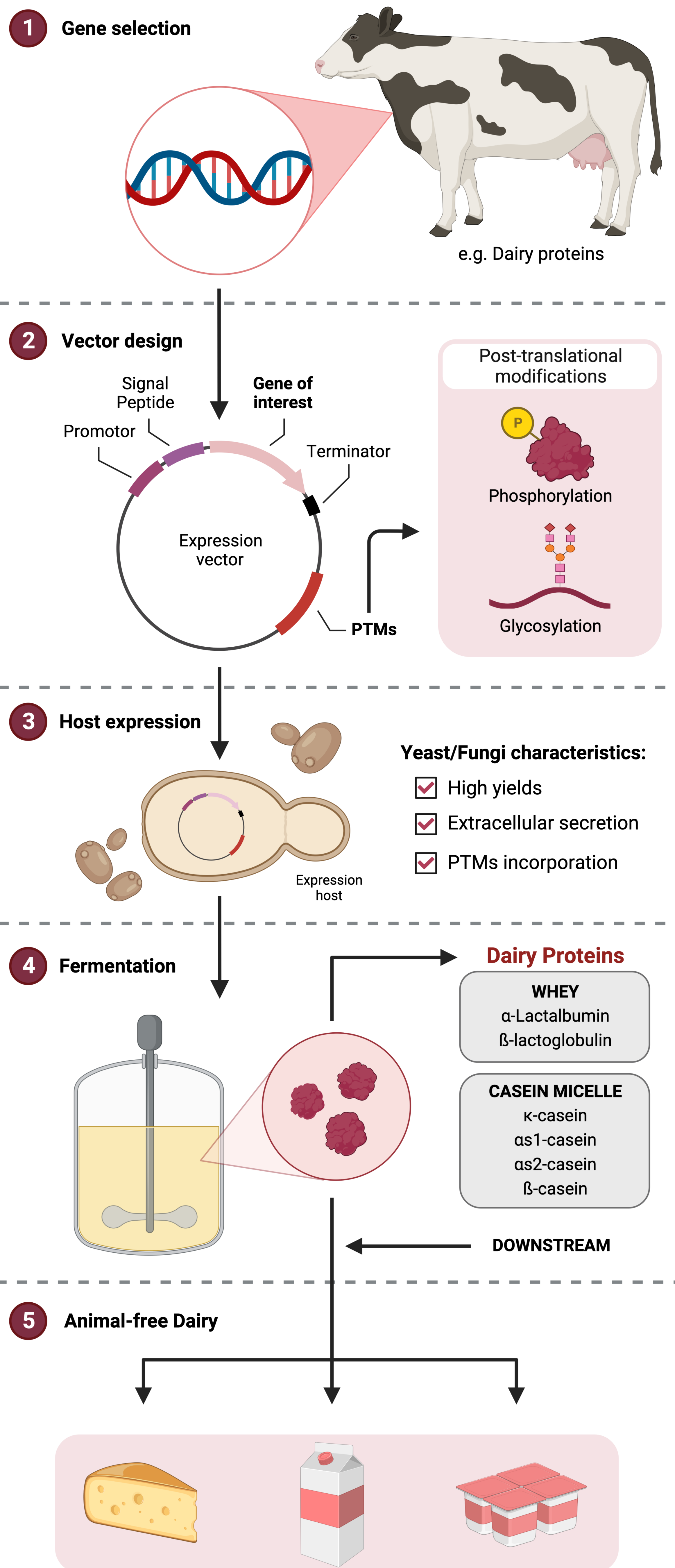
Some GRAS characteristics

- Non - toxic
- Non - pathogenic
- Well characterized

Examples

Bacillus subtilis
Saccharomyces spp.
Trichoderma reesei
Pichia pastoris

How does it work?



Market Landscape

The potential of this technique is reflected in the large number of companies present in all parts of the world, in addition to the large investments of money involved.

62 precision fermentation companies in 2023

Investments of \$ 938 M in 2021

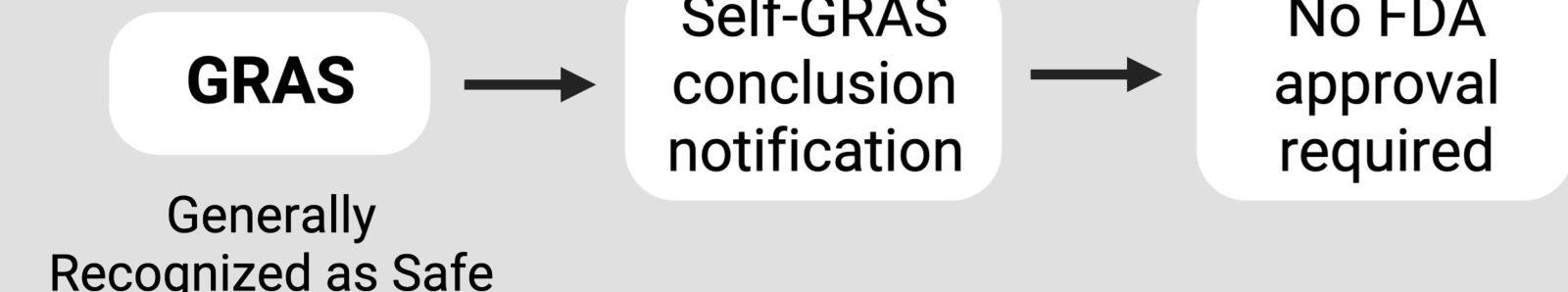
Companies in USA and Europe



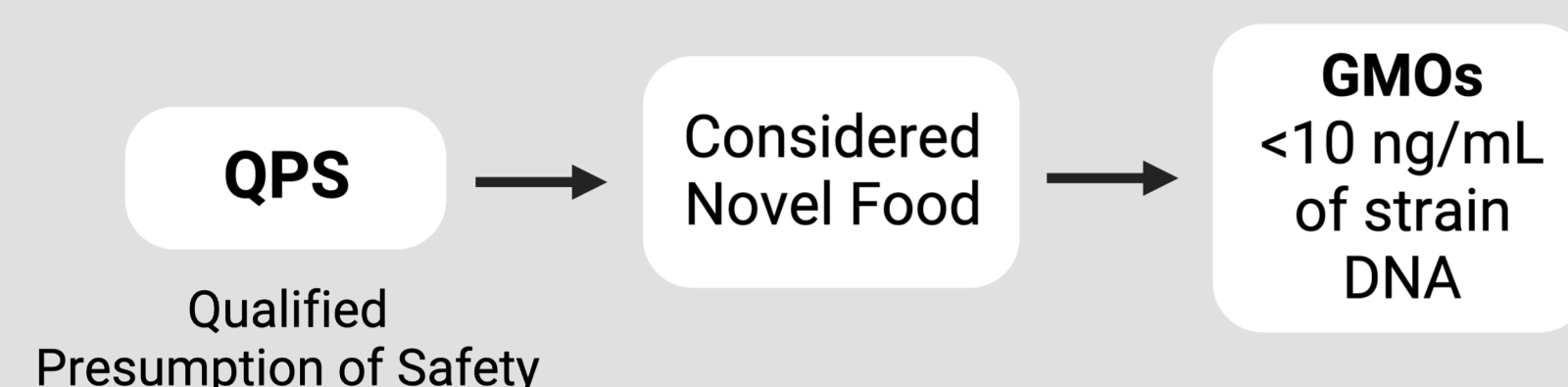
USA and EU regulation



Food and Drug Administration



European Food Safety Authority



Several products are currently available in the U.S. market. In the EU still remain to be approved.

CONCLUSIONS

We can see that **Precision Fermentation** is a technique that from a biotechnological point of view has been well known for several years, and is favored by advances in synthetic biology, which will allow the reduction of costs over the years. We can also see that it has many advantages over the conventional food system, and is supported by the market, but is currently limited by regulatory processes in different countries.

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