EFSA'S 27TH SCIENTIFIC COLLOQUIUM "CELL CULTURE-DERIVED FOODS & FOOD INGREDIENTS"

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EFSA'S 27TH SCIENTIFIC COLLOQUIUM

EFSA's Scientific Colloquium 27 "Cell culture-derived foods and food ingredients"

11 May 2023, 09.00 - 12 May 2023, 12.30 (CEST)

Brussels, Belgium and online

Share:

CELL CULTURE-DERIVED FOODS

PRECISION FERMENTATION

- Sectors in the agri-food system
- State of the art of relevant concepts, technologies, and derived products
- Emerging safety and methodological aspects and their impact on EFSA's risk assessment approaches

https://www.efsa.europa.eu/en/events/efsas-scientific-colloquium-27-cell-culture-derived-foods-and-food-ingredients

EFSA'S SCIENTIFIC COLLOQUIUM 27
"CELL CULTURE-DERIVED FOODS AND FOOD INGREDIENTS"

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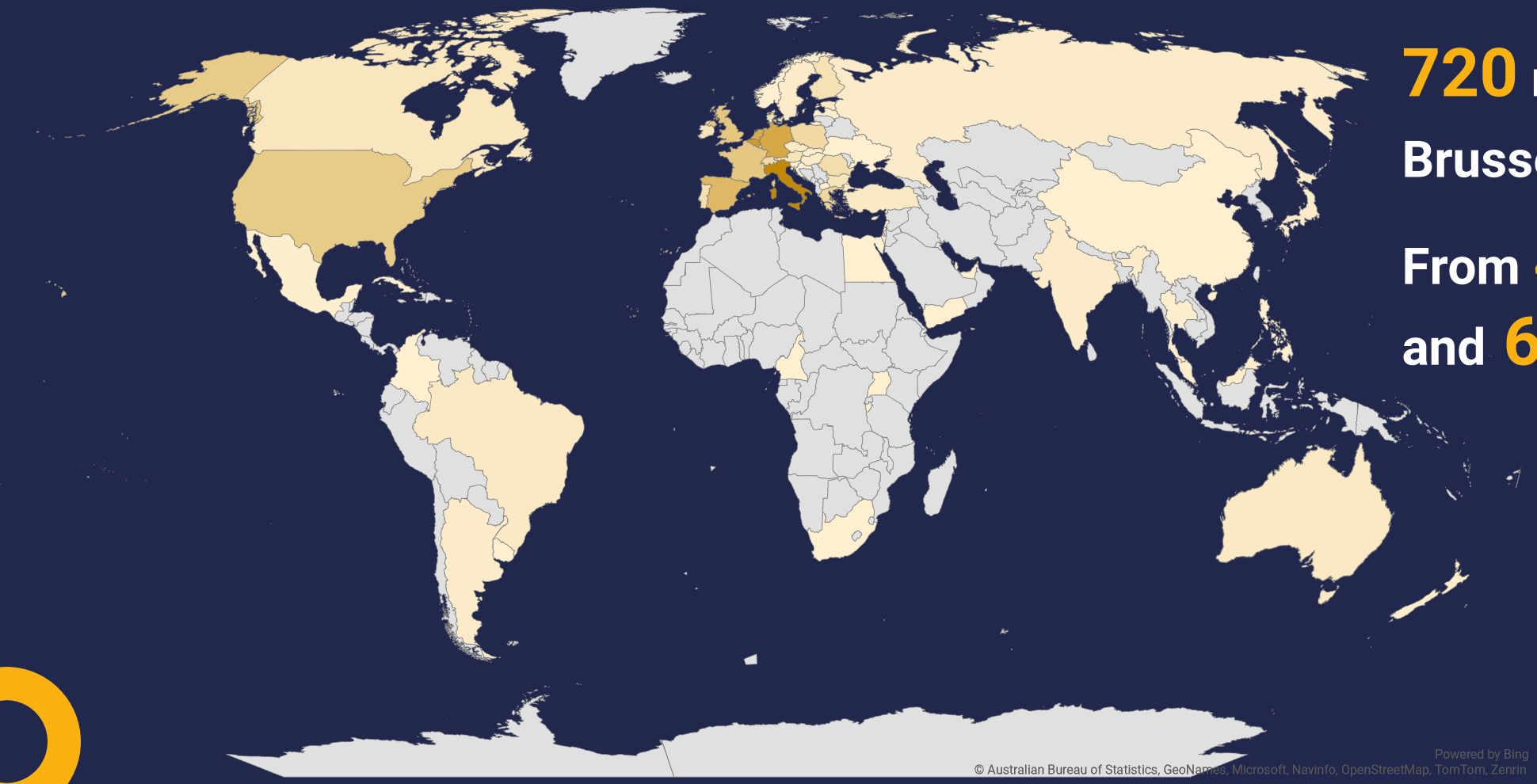
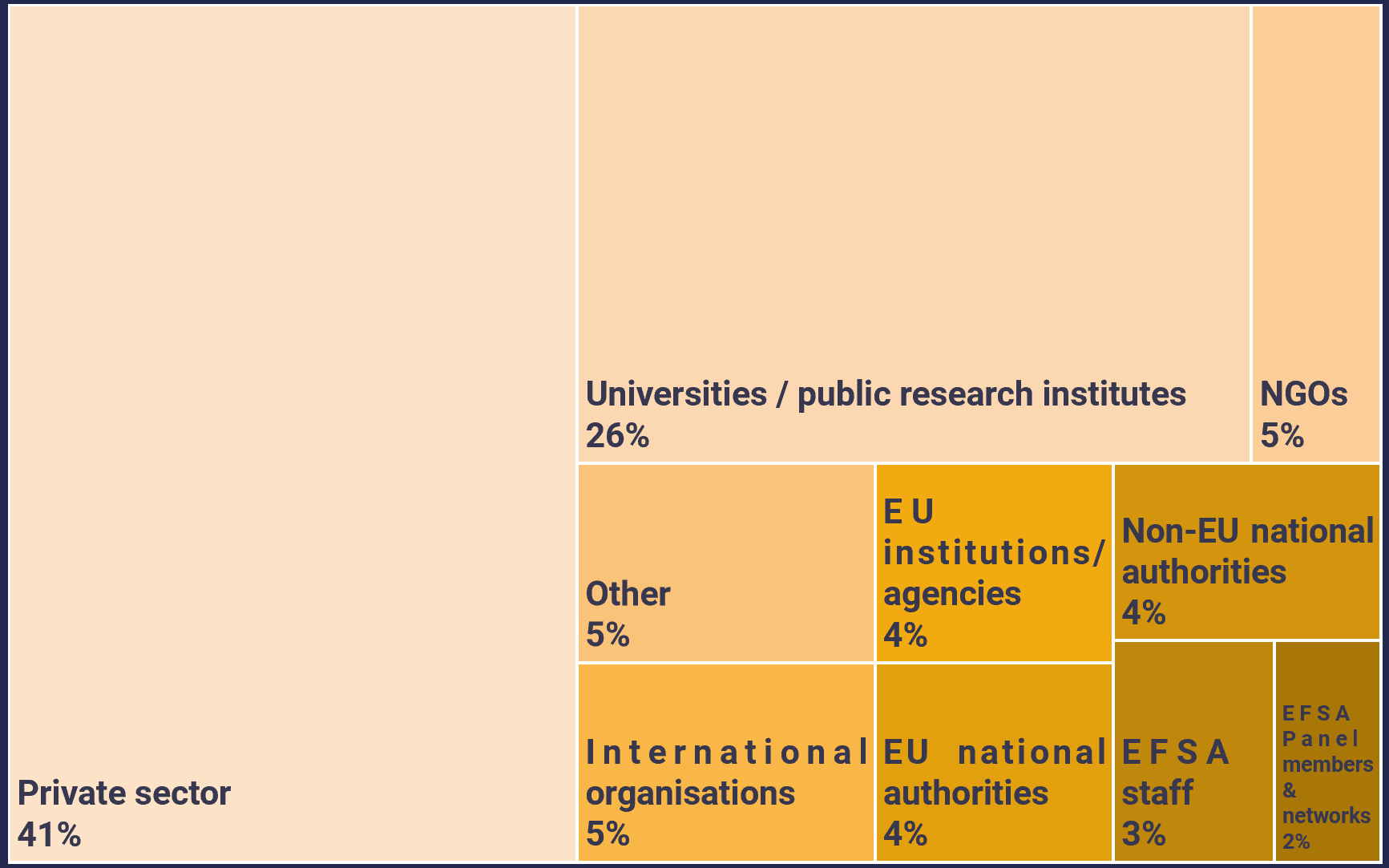


720 registrants (**120** in Brussels, **600+** online)

From **466** organisations and **62** countries

SCIENTIFIC COLLOQUIUM 27
"CELL CULTURE-DERIVED FOODS AND FOOD INGREDIENTS"

720 registrants from:

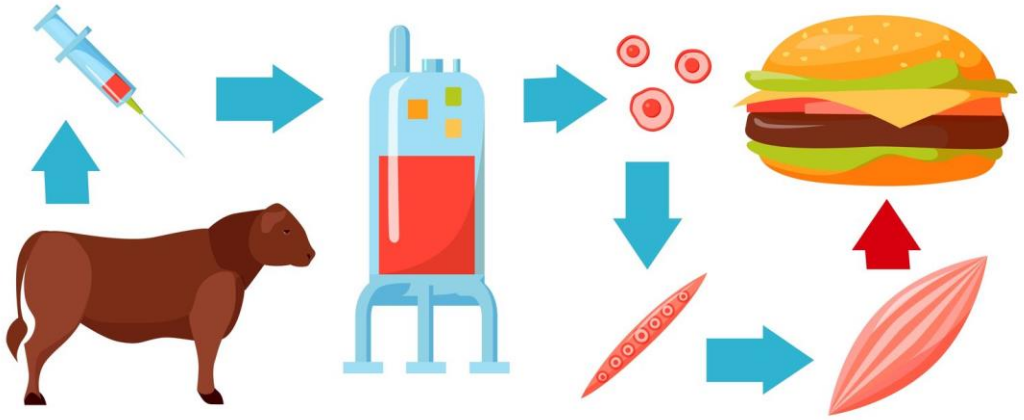


CELL CULTURE – DERIVED FOODS (OF ANIMAL OR PLANT ORIGIN)

Cell culture-derived foods (CCDF)

In **absence of a regulatory definition** and for the purpose of the EFSA's SC27, CCDF refer to **foods produced by the propagation of animal or plant cells, assisted by tissue engineering techniques**

- Use of animal or plant-derived cells towards ensuring a safe and consistent product
- Bioreactors, culture media and their components
- Scaffolding structures – properties & types
- Nutritional information & the concept of nutritionally disadvantageous
- Toxicology & Allergenicity aspects



- **EFSA's Novel Food Risk Assessment: Apple fruit cell culture biomass**
- Output adopted by the EFSA NDA Panel: 24 May 2023

STAKEHOLDERS' FEEDBACK: CELL CULTURE – DERIVED FOODS

- Uses of **immortalized cell lines *vs* primary cells** (recurring biopsies and isolations): do not necessarily lead to a final product with the same degree of **consistency**.
- The product of a small/medium scale production **will not necessarily be representative** of what will be produced when scaling up the process.
- **Phenotypic and genetic stability** of cells: to be tested throughout the different production process steps.
- **Thorough information on the components/materials** (e.g., comprehensive certificates of analysis) used at each step would contribute towards **predicting the hazards** potentially present in the final product.
- **Threshold of Toxicological Concern (TTC)** to assess the safety of components not usually present in food (accumulation in cells/final product)

STAKEHOLDERS' FEEDBACK: CELL CULTURE – DERIVED FOODS

- Reusable scaffolds could introduce **chemical contaminants** to CCDF through **sterilization process residues** and/or **scaffold degradation** over time
- Depending on the material used and the production process implemented to manufacture the scaffolds, different **processing contaminants** may occur in the scaffold, and then subsequently end up in the CCDF.
- The nutritional **composition of the culture media**, as well as the subsequent **use of the nutrients by the cells** during the process will determine the concentration of these nutrients in the final product.
- **Antinutrients** from plant-derived materials (e.g., culture media, components or scaffolds), may be present in CCDF

STAKEHOLDERS' FEEDBACK: CELL CULTURE – DERIVED FOODS

- A comprehensive **compositional characterization of the components/materials** used and of the **final product** could potentially mitigate the need for 90-day toxicological study – Integration of **NAMs** in the current toxicological testing approach is challenging
- **Modelling on the fate of compounds** may be useful complimentary to residue analyses
- **Untargeted analyses (-omics)** of the media after harvesting the biomass could help to **understand** further **the toxicological properties** of the production process (components, materials, by-products). The **implementation** of such analyses is **currently challenging**.
- Allergenicity due to:
  a) new proteins produced (*different genes expressed*)
  b) components
  c) scaffolds.

PRECISION FERMENTATION (PF)

DEFINITION OF PF

In **absence of a regulatory definition** and for the purpose of the EFSA's SC27, PF refers to the use of **engineered microbial cell factories** in the production of **food ingredients**

Pre-market authorisation under different regulatory frameworks (e.g., novel foods, food additives and flavourings, GMOS, etc.)

Several **sectoral & cross-cutting EFSA guidance** documents (scientific requirements for the **risk assessment**)

Product categories **1-2** (free from DNA & viable cells) and cat **3** (contain DNA but not viable cells)
(EFSA GMO Panel, 2011; EFSA Scientific Committee, 2022)

STAKEHOLDERS' FEEDBACK: PRECISION FERMENTATION (Engineered microbial cell factories)

- No disruption in current approaches for RA – **Safety-by-design** to minimise safety issues
  - **Phenotypic** data in addition to genomic data
  - Sufficient knowledge about the **metabolism** of the host strain to allow predictions of possible adverse effects (e.g., computational models) and optimise production
  - **Strain stability** only relevant for category 4 products
  - **Horizontal gene transfer** relevant if genes of concern are present. Safety of newly introduced sequences (e.g., allergenicity) to be assessed (GM strain traceability)

- **QPS** concept could be extended to GMMs generated by **NGTs** (strain *vs.* species)
  - Hazards (GMMs) are **independent** of the technique used for genetic modification
  - **Off-target** effects (point mutations introduced by NGTs *vs.* naturally occurring) could be assessed through e.g., toxigenicity/pathogenicity testing

Limitations of **OMICS** (other than genomics) for routine use in risk assessment. Future developments in **automation** are expected to reduce costs and allow standardisation

STAKEHOLDERS' FEEDBACK: PRECISION FERMENTATION (Food ingredients)

- Comparative approach could be followed when native counterparts exist
- A consensus is needed between risk assessors & managers on the **acceptable level of identity** (how similar must the native & recombinant products be?)
- **Post-translational modifications** (product integrity and/or protein function)

- **Harmonisation** of methodology to assess the fate in the GI tract (i.e., digestibility, bioavailability, ADME)
- Classical tox studies might not be needed for the risk assessment of macro-nutrients (e.g., proteins) – **NAMs** to be integrated (RA)
- **Allergenicity** WoE approach – Sufficient for products similar to native substances

New-to-nature products

- Concerns for allergenicity – Lessons can be drawn from ICH guidelines for biotechnology products (pharmaceuticals)
- Imbalanced nutrition, e.g., by altering bioavailability

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