



Food and Agriculture
Organization of the
United Nations



World Health
Organization

NINE THINGS TO KNOW ABOUT FOOD SAFETY ASPECTS OF CELL-BASED FOOD

TECHNICAL BRIEF

In April 2023, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) launched a milestone publication “Food safety aspects of cell-based food”. Here are nine things for those working in government in the area of food safety to know about cell-based foods.



Read the full report

Food safety aspects of cell-based food

<https://www.fao.org/3/cc4855en/cc4855en.pdf>

<https://apps.who.int/iris/rest/bitstreams/1495370/retrieve>



1. What is it?

Cell-based food production involves culturing cells isolated from animals. Various food end products can be developed using muscle and fat tissues from cattle, pigs, poultry, fish, shrimp, crabs, lobsters or even kangaroos.

The production processes for the various cell-based food products may be different from one another. Having a basic understanding of the generic production process is necessary prior to help in the identification of potential food safety hazards. Read more in **Section B-2** “Generic understanding of production processes” of the full report (page 18).

Cell-based food production and food safety

- > La producción de alimentos a partir de células y la inocuidad de los alimentos
- > La production d'aliments à partir de cellules et la sécurité sanitaire des aliments
- > Производство пищи на основе культуры клеточных технологий и безопасность пищевых продуктов
- > 细胞培养食品的生产和食品的安全
- > إنتاج الأغذية القائمة على الخلايا وسلامة الأغذية



Watch the full video

<https://www.youtube.com/watch?v=YyUoP2d3Zos>



2. What's in a name?

What would you call a food that is made by cultivating animal cells in an enclosed tank or container? Is it still “steak” or “chicken” if it gives you a similar experience in terms of taste, smell, texture and nutrients? FAO and WHO are currently using “cell-based food” as a working terminology, but this term is not yet internationally harmonized.

There are a number of names that are currently being used in the mainstream media for “cell-based food”, including “artificial”, “lab-grown”, “fake”, “clean”, “cellular” or “in-vitro”. Some of them clearly carry value judgements. Others, that include “cultured” or “cultivated” in the name, could be confused with products such as farmed fish. Furthermore, meanings and regulatory names for “meat” or any other commodity names vary from country, so the use of the terms such as “meat”, “milk” and “seafood” might not be acceptable to refer to a cell-based food product in all countries or regions.

No single term has yet emerged as being universally accepted. There are currently around 6 500 languages spoken in the world. International harmonization of terminology is definitely useful, but more importantly, the term should be understandable at the local level.

Read more in **Section D-4.6** “Special considerations on terminologies” (page 116) and the evidence-based literature synthesis in **Section B-1** “Terminologies” of the full report (page 4).

FAO Story - What should we call foods grown from animal cells? Defining terminology as the first step in food safety

- > ¿Cómo deberían denominarse los alimentos derivados de células animales? Definir la terminología como primer paso de la inocuidad alimentaria
- > Comment faut-il nommer les aliments créés à partir de cellules animales? Définir la terminologie est la première étape en matière de sécurité sanitaire des aliments
- > Какое название дать продуктам, выращенным из клеток животных? Введение терминологии как первый шаг в обеспечении безопасности пищевых продуктов
- > 用动物细胞培养出的食物叫什么？定义术语是食品安全的第一步
- > ماذا نسمي الأغذية المنتجة من خلايا حيوانية؟ تحديد المصطلحات هو الخطوة الأولى لضمان سلامة الأغذية



Read the full story

<https://www.fao.org/fao-stories/article/en/c/1632086/>

3. Cell-based foods are no longer “futuristic” products

Cell-based foods sound futuristic. We can imagine sophisticated machinery in a scientific laboratory with high-tech tools. The reality is that production of cell-based foods now takes place in regular food production facilities. It is true that equipment and materials used for its production are new to the food industry, and the production cost of cell-based food has not yet sunk to the level that consumer prices of similar conventionally produced products could be met. However, developers are scaling up their productions. Take a look at the photos in the publication (pages 17, 51, 71, 109, 115, 117) to see how cell-based foods are ready to be served.

4. Why should food safety come first?

Food safety comes first, because if safety cannot be assured, there is no point of discussing of sustainability. There is an immediate need to ensure that risk-based rigorous methods are used to assess the safety of cell-based foods. A 20-minute educational video “Ensuring the safety of cell-based food” shows the various food safety measures that are typically used in producing cell-based food. The video explains that while cell-based food production is new, the methods of ensuring food safety can be quite similar to those used in other forms of agriculture products. Read **Section B** “Generic understanding of production processes” of the full report (page 18) to understand the four stages of production that can be used as a guide to consider potential food safety hazards.



Ensuring the food safety of cell-based food

Watch the full video

https://www.youtube.com/watch?v=Vn70CVV_o4Y&t=823s

5. What about sustainability?

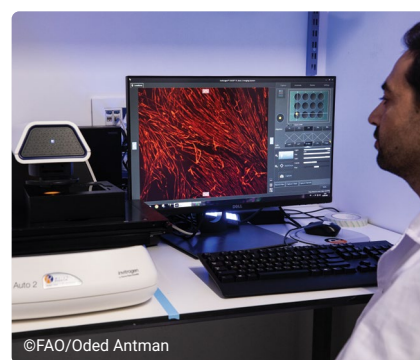
Could cell-based foods provide a sustainable source of animal protein in the event of a large-scale livestock or poultry epidemic? Can they help to significantly reduce the environmental impact of conventional animal agriculture, including greenhouse gas emissions, land use, and water consumption? Could they contribute to food security in low-income countries? Are the nutrition compositions of cell-based foods equivalent to conventionally produced animal products? Could this be a win for animal welfare?

While there are many efforts underway to address these questions, the technology is still in an early phase of development. Currently, the only data available are from rather small-scale production and there definitely is a need for the many phases of cell-based food production to be validated in large-scale manufacturing facilities. The FAO/WHO publication currently focuses on the issue of food safety. However, it is important for regulators to consider these questions in the context of their agrifood systems and the national food policies. Read [Section E](#) “Conclusion and a way forward” of the full report (page 118) to understand how we can move forward with meaningful future work on the topic.

6. How food safety competent authorities can prepare?

Market entry of cell-based food products may require authorization at different levels, and this authorization should include a food safety assessment. As Table 4 in [Section B-3](#) “Regulatory frameworks” of the full report (page 29) shows, the FAO/WHO literature review found 10 countries/economic zones that have made relevant information publicly available. The levels of regulatory readiness vary among them, and there is currently a limited amount of information available on the situation in low-income countries. As an illustration, the 2023 FAO/WHO publication includes three country case studies.

In [Israel](#), regulatory agencies are working to establish effective approval systems that involve a food safety assessment process. In 2021, Qatar approved the establishment of a production-only factory for cell-based foods. [Qatar](#) highlighted that their regulatory framework is strongly supported by regional standards, and many other countries with similar situations may benefit from understanding how Qatar coordinates the relevant activities within the regional scheme. [Singapore](#) approved one cell-based food product in 2021 and the pre-market approval process has been set up with technical guidance on food safety assessments. Details of these regulatory actions and good practices are available in [Section C](#) “Country case studies” of the full report (page 40).



7. What has been done at the international level?

FAO and WHO are working with food safety competent authorities as well as researchers, cell-based food developers and non-governmental organizations to advance our collective knowledge.

FAO and WHO held an Expert Consultation meeting in November 2022 to conduct the first global food safety hazard identification of cell-based food. A comprehensive hazard list was developed based on four stages of cell-based food production in [Section D-4.2](#) “Hazard tables by four production stages” of the full report.

What made the hazard identification unique is the provision of a strict analysis for the causal chains for potential hazards. The experts further highlighted certain key elements that can be considered for practical food safety plans. These elements can be a good reference for competent authorities to develop regulatory guides for their industries who will be responsible for building effective risk-based food safety plans. All hazards were further analyzed by hazard categories in [Section D-4.3](#) “Explanations about the identified hazards” of the full report (page 99).

8. From a communications standpoint, what can regulators do to address consumers' potential concerns about food safety?

The FAO/WHO publication has a short guide developed by social scientists to help food safety competent authorities to consider effective communication in **Section D-4.5** "Food safety communication and building consumer trust" of the full report (page 112).

The publication also contains a chapter in **Section D-4.4** "Concerns not included in the scope of hazard identification" of the full report (page 110). This section captures some additional purported concerns that people may encounter in news coverage and on social media. These texts can help to prepare regulators to plan for evidence-based communication out to the public.



9. Some of the next steps that competent authorities can consider undertaking

1.

Consider holding stakeholder meetings with cell-based food developers. First-hand information will always help in developing a good understanding of the "in-country" situation, especially as such information may not be readily available publicly.



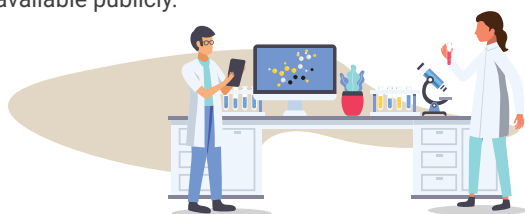
2.

It may be useful to actively listen to consumers to understand what they want to know.



3.

To avoid confusion in the future, it may help to establish and use consistent terminology that is understandable to the public.



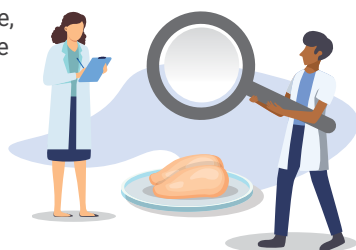
4.

A review of other countries' regulatory situations may be useful to identify both good practices and lessons-learned. Informal technical network that FAO maintains to exchange information among regulators can further aid in such experience sharing.



5.

A review of existing national regulatory frameworks may reveal that it is not needed to establish new regulations. There will most likely be multiple units, agencies, departments or even ministries responsible for relevant regulatory actions. Multisectoral engagements is critical.



6.

Consider simulating possible scenarios such as, what are the regulatory options if a cell-based food product arrived tomorrow at the border? How could a start-up company be supported if asked for guidance to conduct a food safety assessment?

