

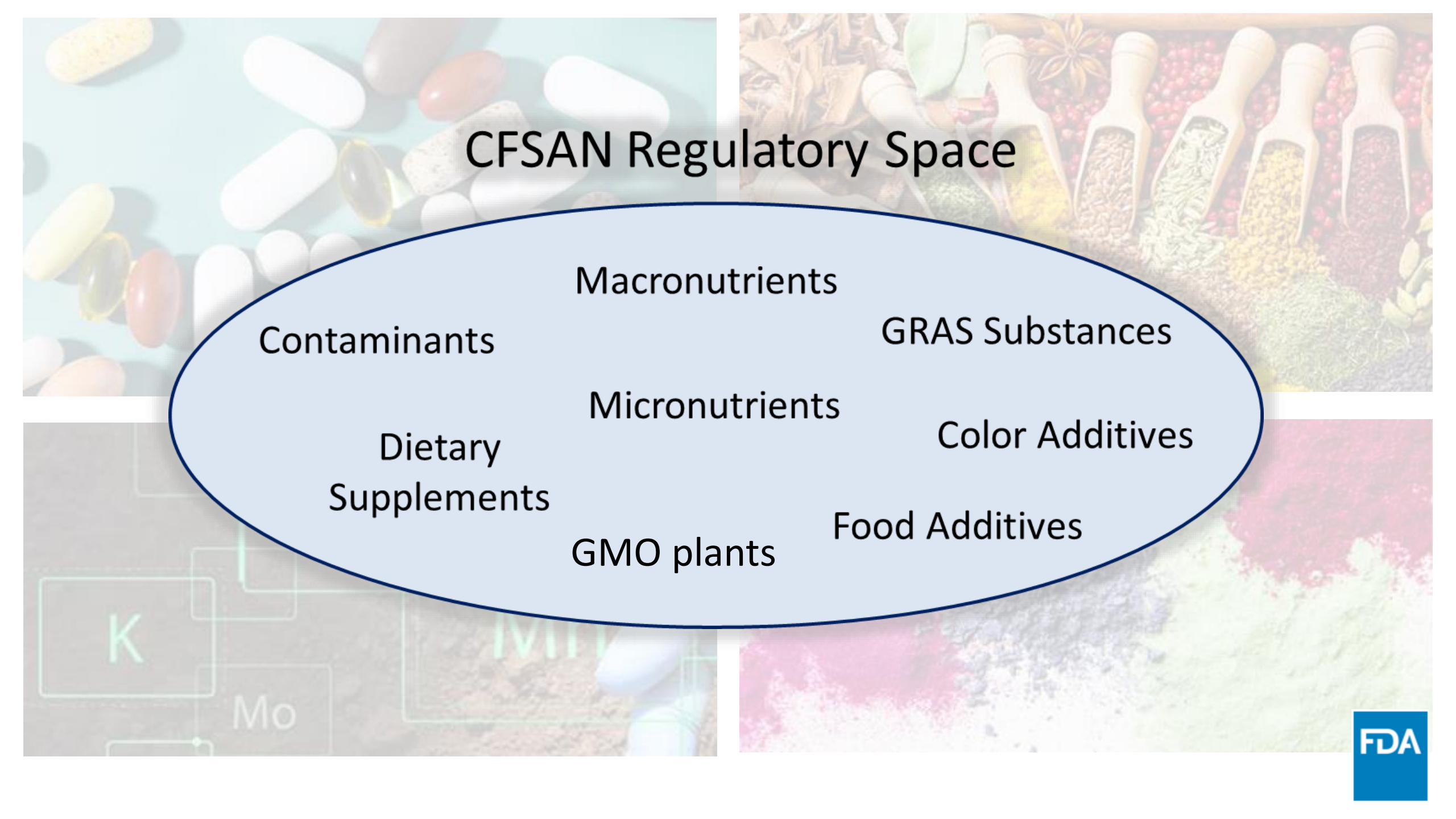
Update from US FDA/CFSAN: Innovative ingredients and technology in food safety

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CFSAN Regulatory Space

Macronutrients

GRAS Substances

Contaminants

Micronutrients

Dietary Supplements

Color Additives

GMO plants

Food Additives

Food Drug and Cosmetic Act

Section 409

201(s) The term **“food additive”** means any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (including any substance intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food...if such substance is not generally recognized,... to be safe under the conditions of its intended use.

“Reasonable certainty of no harm under the intended use conditions”



FD&C Act: Adulterated Food

Section 402



Any food that is, or bears or contains, an unapproved food or color additive is deemed **unsafe** (per Sections 409 and 721) and is therefore **adulterated** under the FD&C Act.

Section 402



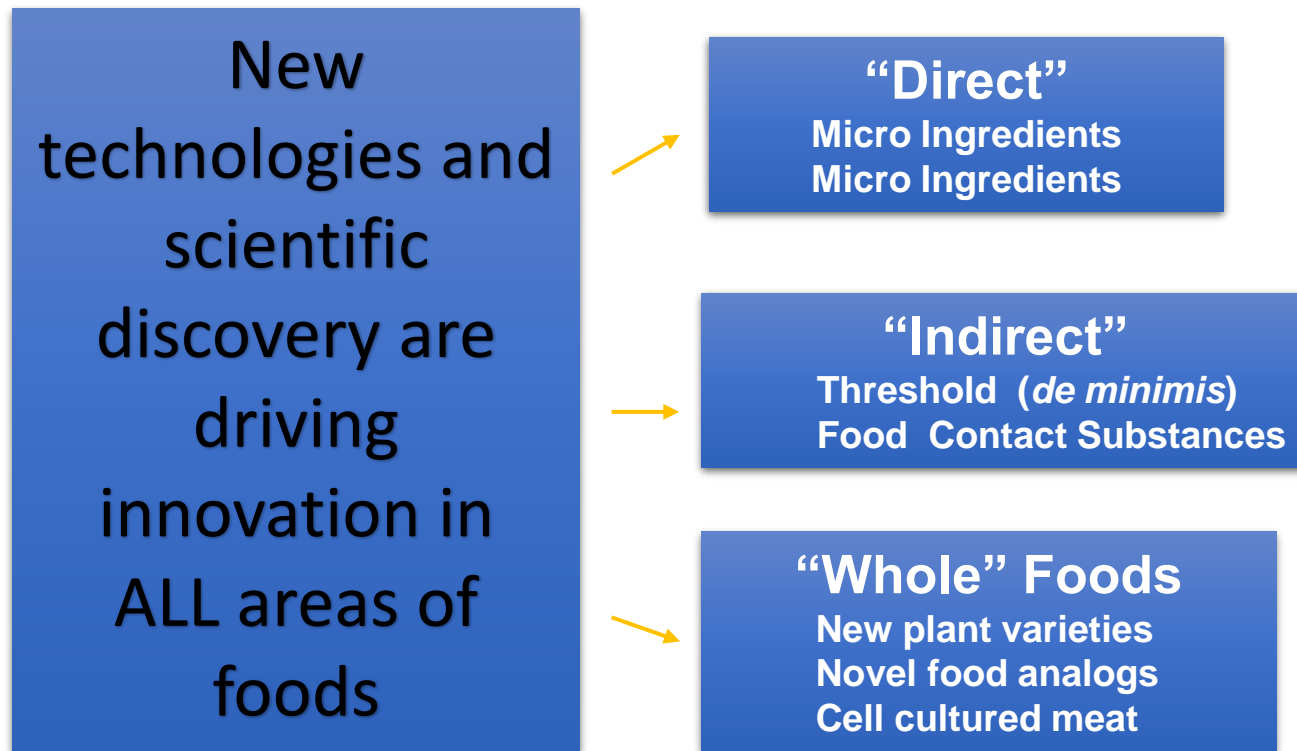
Any food that is, or bears or contains, an added poisonous or deleterious substance which may render it injurious to health is **adulterated** under the FD&C Act.

Section 402



Any food that has been prepared, packed, or held under insanitary conditions whereby it may have become contaminated with filth, or whereby it may have been rendered injurious to health is **adulterated** under the FD&C Act.

Pre-market Programs



- **Food additive and color additive petitions**
 - FDA approval, resulting in a regulation
- **GRAS Notifications**
 - FDA evaluation of independent conclusions that uses of substances are safe
- **Food Contact Notifications**
 - FDA authorization of company-specific uses of food contact substances
- **Biotechnology Consultations**
 - FDA evaluation of information showing that food from genetically engineered plants is safe
- **Cell Culture consultations**
 - Two independent consultations completed so far.

Our people



- **Core Disciplines**

- Chemist/Exposure Expert
- Toxicologist
- Regulatory expert

- **Additional Disciplines**

- Microbiologist
- Environmental Scientist
- Nutritionist
- Specialized toxicologist e.g., R/D, genotox, neurotoxicology
- Statistician/data scientist
- Pharmacologist
- Pathologist
- Clinical data reviewer

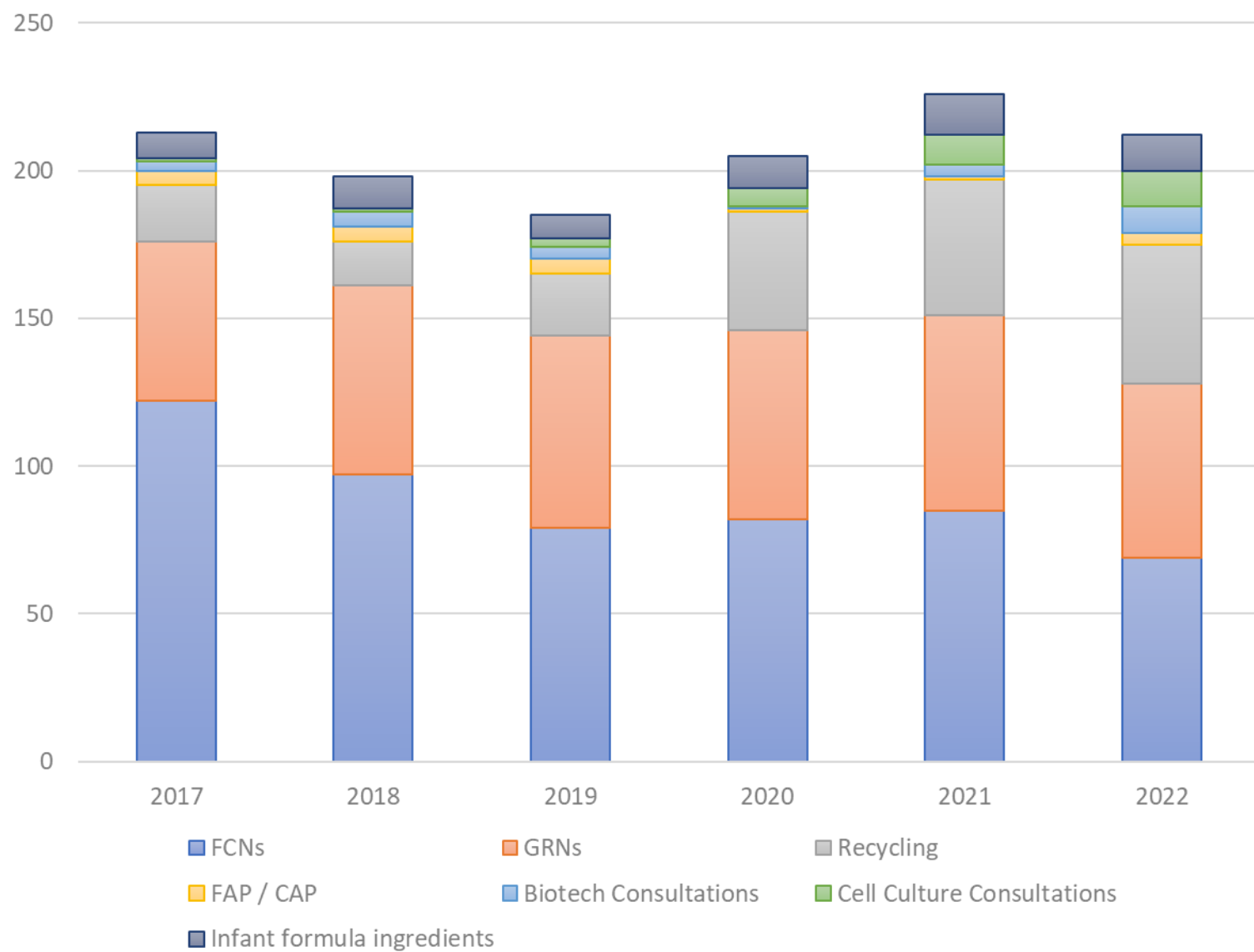


Food Safety Assessment: Basic Elements



- **What is it?**
 - Identity, properties, and composition
 - Manufacturing process
 - Specifications, limits on impurities/contaminants
- **What are its intended uses?**
 - Purpose or technical effect (why is it added to food?)
 - Food categories
 - Use levels
- **How much will people consume of it?**
 - Exposure estimate based on maximum intended use levels and food consumption data
- **Will amounts consumed be safe?**
 - Data and information supporting safety at estimated exposure levels
 - Appropriate data informed by exposure, biochemical properties, functional properties

Pre-market submission review

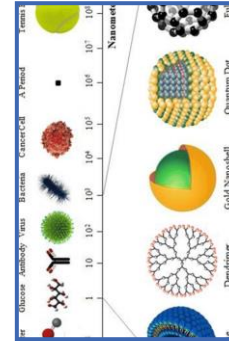


Pre-market programs support food innovation



New innovative food ingredients

- The GRAS Notification Program routinely evaluates new food ingredients produced through novel application of food technologies such as genetic engineering, fermentation, and bioprocessing



Nanoscale substances

- Guidance issued by FDA in 2014 on how to consider significance of changes to manufacturing process for safety assessment, including use of nanotechnology



New plant varieties produced by modern biotechnology

- Plant Biotechnology Consultations are a long-standing process to evaluate potential effects of genetic engineering or gene editing on safety of food from a new plant variety



New food contact and packaging materials

- New substances or changes in manufacturing or uses of existing packaging are reevaluated through the food contact notification program



Innovation in food colors

- New colors, either derived from natural sources or newly synthesized must be evaluated through the Color Additive petition process

Approach to Food Innovation



Innovations in science and technology continue to generate new ways of making food



FDA combines long-standing authorities with policy and scientific knowledge to regulate food safety



This approach is flexible and adaptable to a wide variety of new food production technologies



FDA safety evaluation is targeted to the ingredient and its intended use, method of manufacturing is considered as it pertains to safety

Externalities: Innovation, Advancement, & Impact



Biotechnology Applications

- Animal cell & tissue culture
- Microbial production of micro- and macro- nutrients
- Synthetic biology
- Genome editing

New Products & Processes

- Plant breeding to maintain productivity and consumer needs
- Innovative approaches to produce essential nutrients (proteins, fats and oils, and carbohydrates)
- New ingredient sources and production technologies

Scientific Advancement

- Advances in information technology
- Advances in safety assessment methodologies
- Advances in toxicology testing methods
- Advances in analytical methods
- Novel, innovative developers

Impact

- Innovators
- Farmers and food producers
- Food processors and manufacturers
- Global food industry
- Consumers, NGOs, national food regulators, international standard-setting organizations, WTO, OECD, FAO, WHO

Advancing new approach methodologies (NAMs)

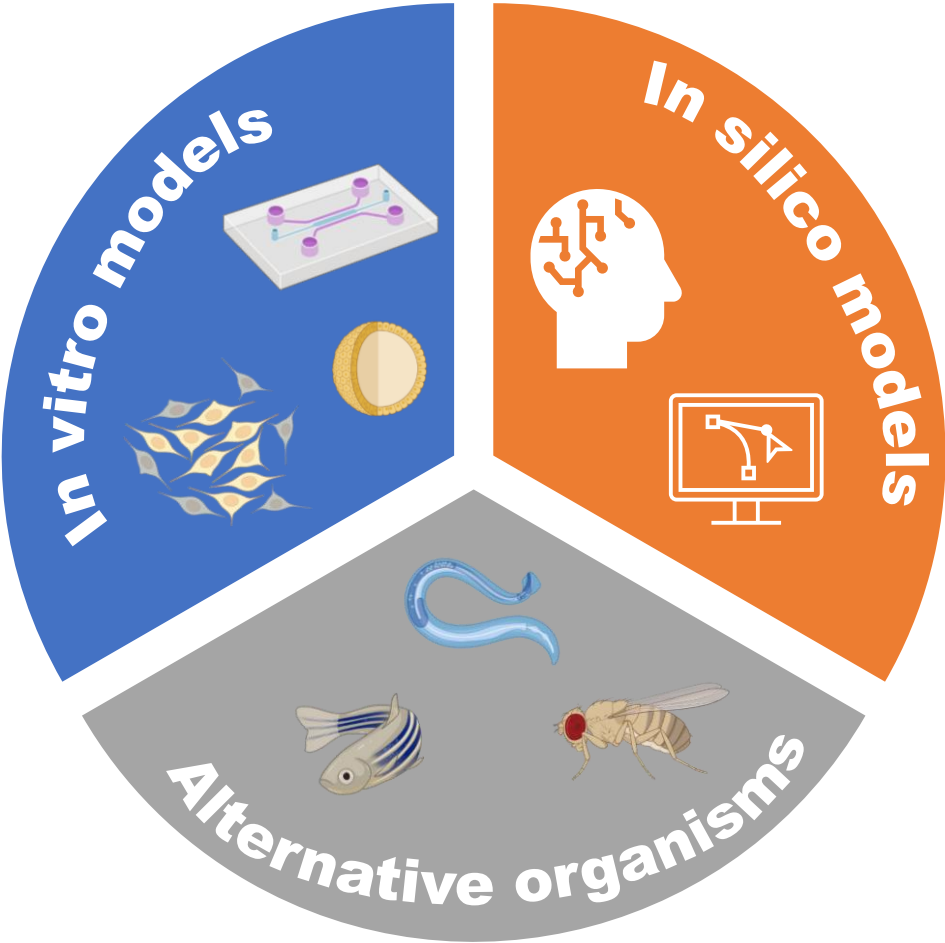


- FDA has had a long-standing commitment to promote the development and use of new technologies to evaluate and predict the safety, effectiveness, and reliable manufacture of regulated products.
- FDA recognizes that new technologies may help bring FDA-regulated products to market faster, with improved efficacy, or prevent products with increased toxicological risk from reaching the market.



Report available on the FDA webpage

Alternative Methods – Lots of them

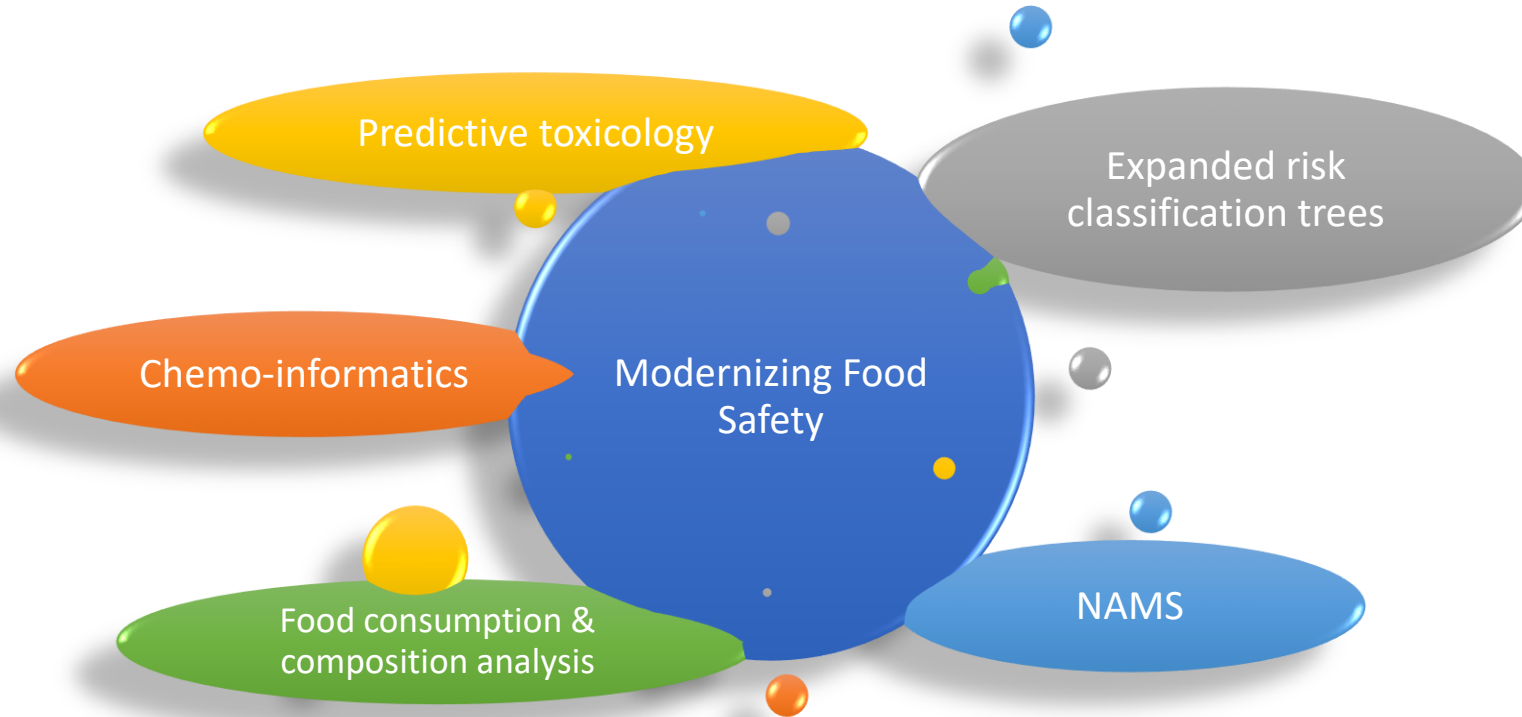


Tox-GAN: An Artificial Intelligence Approach Alternative to Animal Studies—A Case Study With Toxicogenomics
 Xi Chen ,* Ruth Roberts ,^{†,‡} Weida Tong,^{*,1} and Zhichao Liu^{*,1}
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[†]Apconix Ltd, Alderley Edge SK10 4TG, UK; and [‡]Department of Biosciences, University of Birmingham, Birmingham B15 2TT, UK

Effect of ketamine on gene expression in zebrafish embryo
 Jialiang Gu, Jyotshna Kanungo
 First published: 17 May 2021 | <https://doi.org/10.1002/jat.4199>
 Funding information: NCTD-BLISFDA, Grant/Award Number: 50767501

Reevaluation of the embryonic stem cell test
 Amy L. Inselman^{a,*}, Greg T. Nolen^a, Ching-Wei Chang^b, Wafa Harrouk^c, Edward Fisher^d, Melissa S. Tassinari^e, and Deborah K. Hansen^a
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Building and incorporating existing knowledge and new tools



Use of modernized tools can help support priorities

- Reduction in the use of animal testing
- Prediction of potential hazards in the food supply
- Improved timeliness of assessments

Conclusions

New Data and information should be fit for purpose for regulatory use



New data and information should be considered along with existing information



Process considered only insofar as it affects properties or safety of food



Early pre-market engagement supports a safe food supply



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ADMINISTRATION