

Food is Medicine: Next Steps Towards Feeding the World Using Nanotechnology Law

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Graphical Abstract



Abstract

Everyone eats, so it is no surprise that food-related trade laws exist at the national, international, and regional levels worldwide. Nanotechnology has transformed traditional food systems—from crop cultivation and harvesting to storage, transport, marketing, drug delivery via food, and waste prevention—since the early 2000s. These combined changes enable humanity to provide clean, safe, and affordable food for everyone. But first, is it safe? The European Food Safety Authority (EFSA) uses strong scientific methods to create a framework for monitoring nanostructures in food from “Field to fork.” Unfortunately, nanoscale titanium dioxide (nano TiO₂) is deemed safe by one law but may be banned as a gametotoxin under another, creating crossroads for international trade of nanomaterials in food. Merging law and science to resolve these conflicting regulations has important implications for global trade, the food industry, and human health. This article offers a broad view of the legal landscape surrounding nanomaterials in food, leaving some questions for further consideration. In conclusion, the time is right to harmonize regulatory approaches.

Keywords: food, law, nanomaterials in food, global health, FDA, EFSA, TiO₂

Rationale, Purpose, and Limitations:

This research is driven by the rising commercial interest in producing components for processed foods and shipping fresh foods globally

for human consumption. For the EU, concern about nanomaterials in food has been a regulatory issue for nearly a decade. In the USA, few researchers have focused on the use of nanomaterials, which are generally exempt from

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federal Food and Drug laws under the assumption that small quantities at the nanoscale are unlikely to cause harm. Because such materials are regulated in Europe and banned in some EU nations, this inconsistency creates a conflict of laws and risks undermining both health and international trade.

The purpose of this study is to identify the main areas of legal consensus and conflict, to highlight the unmet need for harmonization across food laws. This paper aims to foster a new dialogue to find a middle ground that both safeguards public health and supports global food trade and distribution.

Discussions in this paper are limited to law and policy, without exploring the detailed differences between nanomaterials and their various applications in other areas of law. Since everyone eats and every nation regulates food, this knowledge is valuable beyond just traditional bench science or regulatory circles. The article does not seek to create a new legal framework but aims to be a valuable tool for advancing a critical discussion that needs to take place across all countries in the food supply chain.

Introduction: What is happening in nanotechnology regarding food?

Consistent with the legislative agenda set forth in 1999, nanotechnology has revolutionized how science views physical properties of matter and thus has revolutionized commerce by offering new products and ways to package and transport those products that seemed like science fiction a century before [1]. Nanotechnology has been applied to food since the early 21st century, with attendant implications for food quality, quantity, food as a conduit for drug delivery, and distribution [2]. Trillions of dollars have been spent on research and development funding for the application of nanotechnology in global commerce, including crops and pesticides, better storage and longer shelf life for food, and food as a drug delivery mechanism [3]. Food touches every human and every other species in the world throughout daily life. Food is therefore the subject of extensive regulation nationally, internationally, across trade agreements, and under some religious law, too [4].



Figure 1. Ilise Feitshans is presenting at the ICRAN conference at KIIT, Bhubaneswar, Odisha, India

Fortunately, the timing is ripe to harmonize EFSA's and the US GRAS list's positions under the US FDA. Recent developments in tandem on both sides of the Atlantic offer hope that these differences can provide the recipe for

meaningful harmonization of food law, with an inevitable positive impact worldwide. Significantly, recent governmental initiatives by the European Food Safety Authority (EFSA) [5] and the USA White House report Making

America Healthy Again (MAHA) [6] have both drawn attention to the problem that remarkably little is understood about the long-term risks of these changes to the food supply:

(1) cumulative effects of nano-enabled storage, transport, and distribution of food that rely on nanomaterials (such as nanosilver as an antibacterial in refrigeration);

(2) potential impacts of chemicals at the nanoscale that increase shelf life and reduce the risk of food loss;

(3) possible migration of nanomaterials such as carbon nanotubes in packaging, and nanobiosensors that bring nanoplastics into question.

This new approach by the EU, EFSA, and the US government may herald a new era in global health diplomacy, expressing shared values about the role of nanomaterials in food.

First, EFSA has the courage and wisdom to address the key challenges and marvelous promises of nanotechnology applied to food [7], with a view to modifying its guidance so that the key terms of its rules are workable and accessible to the food industry. EFSA's recent request for stakeholder comments in February 2025 represents an important recognition of the legal scholarship that praised this pioneering regulatory work while noting that EFSA rules and guidance may lose their value and become potentially unenforceable if they cannot be reconciled with existing, although inadequate, parallel laws by the USA as a major trade partner. Second, the newly confirmed Secretary of Health and Human Services has pledged to scrutinize for the first time in decades the validity of an exemption for nanoscale materials by operation of law under the GRAS list published by the USA FDA. Reportedly, the Secretary of the US Senate at his confirmation hearings stated that GRAS substances are “innocent until proven guilty” and represent an unquantified and under-reported dangerous threat to public health [8]. This new approach by the USA government heralds a new era for global health diplomacy to express shared values about the role of nanomaterials in food. The implications for rethinking the role of nanomaterials in food are therefore profound. No surprise, the new Secretary of Health and Human Services has pledged to scrutinize the validity of the GRAS list published by the USA FDA for the first time in decades [9]. Although previously evading the attention of regulators in the USA, migration of

nanoparticles and the so-called “fate” of bio-nano interactions are a hot scientific controversy and may therefore enable USA rules to align with EFSA [10]. This article describes how these impactful nano-enabled applications and these transatlantic developments hold great promise for protecting global health while reaping the benefits of nanomaterials used in food.

Discussion: Using the benefits of nanotechnology for food, while minimizing the risk of harm: a comparison of the US FDA and the EU EFSA

Nanotechnology holds important implications for food quality, quantity, and distribution that represent an important admixture of traditional values in food law with emerging agreements governing international trade [11]. As discussed at Nanotechnology 2023, “Law and Ethics of Nanotechnology Safety and Health in Food” [12], emerging science and existing laws hold great promise if synthesized with forethought. For example, the European Food Safety Authority (EFSA) has done an outstanding job of setting the path analysis for tracking oversight of nanostructures in food from “Field to fork” [13]. EFSA analysis represents the synthesis of robust science. But nanoscale titanium dioxide (TiO₂) is recognized as safe under one body of law while subject to calls for its ban as a gametoxin in the other. The law and science required to resolve the conflict of laws that drives this dramatic tension between the two polar opposite approaches to food regulation under well-established laws has important implications for international trade, commercialization of food, and impacts of food consumption that may promote or harm human health. The EU and the USA remain the world's largest trade partners. Thus, the division in their present analytical paths represents a fork in the road for international commerce when examining several nanomaterials used in food. The EU and the USA currently hold two polar-opposite approaches to food regulation under well-established laws, which have important implications for international trade, the commercialization of food, and human health. The classic example of conflicting laws resulting from two very different approaches to risk, therefore, presents an opportunity to discuss the role of nanomaterials in food and to bridge differing approaches to food regulation. Although an EU determination

may not be binding under US law, international trade obligations militate in favor of examining the strongly worded EU law designed to protect the lives and well-being of hundreds of millions of people.

EFSA and EU Parliamentary concerns about TiO₂ in food, therefore, transcend geographic borders that would otherwise limit EU jurisdiction, thereby impacting food law in the USA. Conflicts of law arising from the widespread use of nanoscale titanium dioxide (TiO₂) as an emulsifying agent, a whitener, and to enhance the attractiveness of food provide but one vibrant example of problems arising from these parallel systems. Experts at EFSA, who were appointed to respond to requests for information from the European Commission, have determined that nanoscale TiO₂ is potentially genotoxic and therefore not recognized as safe under EU law. France was the first country to ban TiO₂ in food in 2020. In May 2021, EFSA published an opinion that TiO₂ can no longer be considered safe when used as a food additive. Then, TiO₂ was banned as a food additive for use only as a color in medicinal products across the EU, according to Annexes II and III. Subsequently, the Court of Justice of the European Union annulled part of EFSA's activities to ban TiO₂ based on the agency's determination of carcinogenicity. The November 2022 ruling does not apply to food. Still, the US Food and Drug Administration (FDA) has remained silent about nanostructures in food, having determined decades ago that less than one percent of TiO₂ in food by volume is "Generally Recognized as Safe" ("GRAS") and does not require regulatory oversight.

Significantly, recent governmental initiatives by the European Food Safety Authority (EFSA) and the US White House report, Making America Healthy Again (MAHA), have both suggested that their approaches to nanomaterials in food may change. When nominating Secretary Kennedy, President Trump posted on the web: "Our broken healthcare system harms everyday Americans and crushes our country's budget. He will also cut waste and fraud within our country's most expensive government agency, which is a third of our nation's healthcare spend and a quarter of our entire national budget [14]." According to the Make America Healthy Again Commission report from the White House, "the greatest step the United States can

take to reverse childhood chronic disease is to put whole foods produced by American farmers and ranchers at the center of healthcare [15]."

[US FDA: Titanium Dioxide Color Additive Provisions Under the GRAS List: A Little Bit Can't Hurt You](#)

In the USA, FDA regulations allow TiO₂ to be used as a safe color additive without considering its nanoscale properties, as it is used in everyday consumer products. The genesis of the FDA [16] statute was a public health need for a law to ensure the purity of product labelling and the quality of food sold, dating back to the early 20th century. The Congressional intent was in reaction to an uncontrolled market that harmed millions of people [17]. FDA empowerment has withstood the test of time with remarkable public support. Prior to the FDA's creation by Congress, products were either mislabeled as food or sold even when unsafe to eat. There is no statutory test, however, for what substances constitute food. Any product that enters the U.S. market and is considered food or a food additive (such as vitamins, herbal cures, and dietary supplements) is considered food under FDA law and therefore automatically subject to FDA regulation, without any premarket review.

FDA Act Section 201(f) defines "food": "The term 'food' means (1) articles used for food or drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article [18]."

But, there is more, because the FDA's remarkably broad jurisdiction includes, "FDA-regulated products account for about 20 cents of every dollar spent by U.S. consumers. The FDA regulates about 78 percent of the U.S. food supply. This includes everything we eat except for meat, poultry, and some egg products," and purportedly is worth up to 20% of US GDP.

In 1960, Congress enacted Color Additive Amendments to define the term "color additive" Section 201(t) of the Food, Drug and Cosmetic Act (FD&C); Establish a listing and certification process for color additives (sections 7217 (b) - (e) of the FD&C Act); subsequent Congressional amendments expanded to embrace food adulteration [19]. Those provisions reflected hard-won victories of lobbyists who maintained that it was not possible to control every molecule in food and that some stray ma-

terials are inconsequential. Those materials, according to the law, are not “adulteration” because they are “Generally Recognized as Safe”. Hence, the infamous “GRAS List” was born.

Titanium Dioxide is on the GRAS list, because “Certification of this color additive is not necessary for the protection of the public health and therefore batches thereof are exempt from the certification requirements of section 721(c) of the act.” Subpart A – Foods (a) Identity. (1) The color additive titanium dioxide is synthetically prepared TiO₂, free from admixture with other substances. (c) Uses and restrictions. The color additive titanium dioxide may be safely used for coloring foods generally, subject to the following restrictions: (1) *The quantity of titanium dioxide does not exceed 1 percent by weight of the food [20]* “(emphasis added).

Under 21 CFR 70.3(i), safe means that there is convincing evidence that establishes with reasonable certainty that no harm will result from the intended use of the color additive. Under this construct, nothing in FDA regulations suggests that TiO₂ poses any risk or danger. Consequently, FDA allows use of nanoscale materials without offering a justification that one could use to persuade EFSA or similar regulatory authorities in other continents to disregard the issues about TiO₂, even though food adulteration provisions of the FDA statute governing color additives allow the agency to deem adulterated any food that is, or bears or contains, any color additive that is unsafe within the meaning of section 721 of the Food Drug & Cosmetic Act, section 402(c) of the FD&C Act) [21]. On the surface, this regulatory threshold is less protective of public health than the EFSA operationalization of precautionary principles. Still, there is no known threshold for TiO₂ that justifies FDA action. FDA has not stated a clear regulatory agenda nor a definition of nanotechnology and nano-enabled products that fall under its purview, ranging from mascara, lipstick, and whipped cream to high-tech Covid-19 vaccines, cancer-targeting drugs, and regenerative tissue medical devices. Therefore, nothing in FDA regulations would provide a clue to a consumer who may be unaware of nanoscience about the debate that rages in the courts regarding TiO₂. Nor would there be any notice from the agency to industry, making commercial food manufacturers aware of any potential dangers concerning nanomaterials in

food, even though those dangers have been studied by EFSA abroad.

Consistent with FDA approval law, the names of the materials involved have not changed, such as whipped cream, donut fillings, commercial cake batter, shaving cream, skin care products and cosmetics, and a variety of food fillings. Nor has their composition been altered, so there is no question of misleading labelling or branding. But the function of the substance has changed dramatically. This process-oriented function and characterization must be examined carefully by the FDA within a new framework, appropriate for the nanoscale context. Thus, there is an implicit, and perhaps unintended, exemption for the FDA laws for nanoscale TiO₂ that parallel administrations abroad find unacceptable regarding risks to human health. A fair reading of FDA regulations could give rise to the conclusion that if one percent in food is safe, then surely a fraction smaller than one billionth of the same substance must also be safe. But the inherent benefits of nanotechnology, enabling materials to become stronger and more potent at the smaller nanoscale, render that logical conclusion untrue.

EU EFSA: The Ban That Is Not A “Ban”

EFSA has done an outstanding job of setting the path analysis for tracking oversight of nanostructures in food from “Field to fork.” EFSA also relies on the European Union directive on precautionary principles [22] and therefore emphasizes precautionary regulation and control to a much greater extent than the collective USA agencies. EFSA views the use of nanostructures as a significant promise for improving public health, but one fraught with risks. EFSA therefore has created a method for outlining the scope of restrictions on particular nanostructures on a case-by-case basis, using detailed stepwise analysis in its definitions of regulated nanomaterials published in the official EFSA journal in 2018 [23]. EFSA’s rules address the need for precaution to prevent migration of nanomaterials that may influence human health in the long term, and therefore also regulate “contact transmission” of nanomaterials, to limit the presence of non-food nanostructures in food. Nanosilver in refrigeration is used because of its potent ability to kill microorganisms [24]. Also requiring further scrutiny is the role of carbon nanotubes used in transport and

packaging, with unclear data regarding potential migration into food or their role in nanoplastic retention in the body [25]. According to the Director of EFSA, the mantra remains, “Is it food? First, is it safe? If it is not safe, it is not food.” Therefore, the EFSA approach is the tactical reverse of the FDA [26]. In the USA, federal law extends jurisdiction to any substance that purports to be food, but does not require discussion of quality, whereas the EU approach requires premarket proof that products are safe.

EFSA analysis represents the synthesis of robust science. Applying EFSA’s “Field to Fork” regulatory framework addresses nanostructures in food, soil, transport, packaging, and nanopesticides that may involve use or consumer exposure to TiO₂. EFSA has the courage and wisdom to address the key challenges and marvelous promises of nanotechnology applied to food. TiO₂ is widely regarded as toxic, even in its bulk form, and is classified as a carcinogen by the European Chemicals Agency (ECHA) [27]. Ironically, in the bulk form, TiO₂ is subject to extensive regulation in the USA and abroad [28]. Therefore, the amount of TiO₂ that is used is the actual linchpin of the safe use designation, not an inherently harmless feature of the substance itself. In sharp contrast to the USA law that allows a small amount of a material not otherwise considered to be safe, EFSA has concluded, “Overall, based on all currently available evidence along with all the uncertainties, in particular the fact that genotoxicity concern could not be ruled out, the Panel concluded that *“E 171 can no longer be considered as safe when used as a food additive.”* (emphasis added) [29]. Experts at the European Food Safety Authority (EFSA) recommend banning nanoscale TiO₂ in foods. Several nations follow EFSA’s lead. Therefore, TiO₂ in various products readily available in commerce, ranging from food and cosmetics to housing, challenges pre-existing methods for regulating and managing risk because it is presently unknown which pathways are essential in shaping the impact of exposure, depending on the source or the cumulative experience of exposure.

Interestingly, EFSA does not have the power to declare a ban and cannot enforce guidance that nations have not accepted as binding. Following a proposal from France, ECHA’s Committee for Risk Assessment (“the RAC”) adopted an opinion classifying titanium dioxide

as a category two carcinogen, including the hazard statement ‘H 351 (inhalation)’ [30]. Based on the RAC Opinion, the European Commission adopted Regulation 2020/217, 2 setting forth a Pan-European harmonized classification and labelling of titanium dioxide, “recognizing that the substance was suspected of being carcinogenic to humans, by inhalation, in powder form containing 1% or more of particles of a diameter equal to or below 10 µm. The EFSA expert Panel concluded that although gastrointestinal absorption of TiO₂ particles is low, they may accumulate in the body“ [31]. EFSA’s official report to the European Commission by members of the EFSA expert panel stated: “Several modes of action for the genotoxicity may operate in parallel, and the relative contributions of different molecular mechanisms elicited by TiO₂ particles are not known. There was uncertainty as to whether a threshold mode of action could be assumed. In addition, a cut-off value for TiO₂ particle size with respect to genotoxicity could not be identified [32].”

According to FAQs on the EFSA website, after reviewing all relevant available scientific evidence, EFSA concluded that a concern regarding the genotoxicity of TiO₂ particles (in the food additive E171) cannot be ruled out. Based on this concern, EFSA’s experts no longer consider titanium dioxide safe as a food additive because they could not establish an Acceptable Daily Intake (ADI) for E171. ” Starting with a six-month phasing out period as of February 7, 2022, until August 7, 2022, after which a full ban applies [33]. Following the publication of Commission Regulation (EU) 2022/63 in the EU’s Official Journal (OJ) on January 18, 2022, Annex II and III to Regulation (EC) No 1333/2008 on food additives were amended [34].

Globalization of food commerce is far too multi-layered and complex to enable manufacturers and vendors to exclude products based on the presence of TiO₂ and the regulations at their destination, even though there is extensive niche marketing in food. This renders the clear conclusions from EFSA problematic to apply or enforce. For this reason, EFSA’s recent request for stakeholder comments in February 2025 represents an important recognition of the legal scholarship that praised this pioneering regulatory work. This shift in emphasis from expertise to politics reflects a new understanding that

EFSA rules that rely on robust science as guidance may become unenforceable if not reconciled with existing practical realities, such as U.S. law.

RECOMMENDATIONS: LAW AND POLICY RAMIFICATIONS OF NANOTECHNOLOGY FOR FOOD DISTRIBUTION CHAINS

Nanotechnology in food under the law represents one transformative agent addressing perennial global health legal issues related to food. Nanostructures in food pose challenges about unquantifiable risk that have been gnawing at the larger concerns for risk governance and management for years: not only is the amount too small to study in advance or measure after use, but unlimited sources of exposure to nanomaterials complicate any effort to chart a path for characterizing exposure or analyzing nanomaterial effects [35]. Cumulative doses are difficult to estimate because nanomaterials are ubiquitous in commerce, yet, as demonstrated by the USA GRAS list, they may also be undetected because there is no regulatory reporting requirement for their use.

Equally important, although equally ignored, is the role of addressing the costs of unquantified risk and potential liability from unforeseeable potential harms inherent in the use of any new process, weighed against the remarkable benefits that nanoscience holds, such as the ability to feed the whole world using less food than before [36]. Potential harm from the nanoscale use and application of nanomaterials, therefore, requires a new paradigm for risk governance to address untraceable cumulative effects. Regulatory challenges posed by nanostructures in food and by nanomaterials for food transportation and storage, as well as by the new foods that are nano-enabled, do not change the essential character of food in commerce, making these regulatory issues of risk governance vital worldwide.

Recommendations:

1. Need to educate the general public and policy-makers in order to have meaningful discourse about nanostructures in food from field to fork

There is a need to educate the general public about the relevant laws governing nanotechnologies applied to food in the USA and abroad, and to provide risk communication to directly

impacted and secondary, passive-exposed populations.

2. Create a Transatlantic Commission

Study data, offer policy conclusions about nanomaterials in food across the field to form a paradigm and to draft a roadmap for harmonization.

Although many global efforts for harmonization exist, there is no clear indication of which harmonized body of nanoregulations will become the most important. Meanwhile, well-intentioned researchers in academia, governments, and private industry are nonetheless filling the regulatory void with scientific guidance and developing guidelines to create a risk-testing framework. Concerning the substantive steps for risk management, employing best practices, exposure assessment, and risk communication tools provides the best way to avoid liability and foreseeable harm, as well as to anticipate problems that cannot be predicted at the time of writing. The multitude of nanoregulations and laws that lack a clear hierarchy for prioritization poses an immediate obstacle to sound international commerce because following one law does not guarantee that a conflicting law has also been obeyed. A pressing need for clear mechanisms to promote the swift harmonization of conflicting nanotechnology laws becomes paramount to resolve legal conflicts. Legal analysis of these regulations within the broader legal framework can also offer significant policy benefits by highlighting gaps where new laws might be needed, as well as identifying redundant or unnecessary provisions for removal. Oversight by a commission composed of both experts and novices offers a diverse range of perspectives for open discussion of technical issues, ensuring that regulators have clarity about rapidly evolving standards such as the Integrated Approaches to Testing and Assessment (IATA).

Next Steps for Regulation:

Potential harm from nanoscale nanomaterials requires an enduring new paradigm for risk governance regarding untraceable cumulative effects: not only is the amount too small to study in advance or measure after use, but unlimited sources of exposure to nanomaterials complicate any effort to chart a path for characterizing exposure or analyzing nanomaterial effects. Significantly, recent governmental initiatives by the European Food Safety Authority

(EFSA) and the USA White House report Making America Healthy Again (MAHA) have both drawn attention to the problem that remarkably little is understood about the long-term risks of these changes to the food supply:

(1) cumulative effects of nano-enabled storage, transport, and distribution of food that rely on nanomaterials (such as nanosilver as an antibacterial in refrigeration)

(2) potential impacts of chemicals at the nanoscale that increase shelf life and reduce the risk of food loss;

(3) possible migration of nanomaterials such as carbon nanotubes in packaging, and nanobiosensors that bring nanoplastics into question.

Carbon nanotubes in packaging

Carbon nanotubes have been used to create stronger, more secure, and lighter packaging for food. This packaging is highly effective at keeping out bugs and rodents, ensuring long-term freshness and extending shelf life. It also makes food lighter, which reduces transportation costs. The decreased costs also lower insurance expenses, as food is less likely to be lost

or spoiled before reaching the market. However, trade-offs have not been examined, such as the potential migration of carbon nanotubes into food and the environmental impact of indestructible packaging on the long-term ecosystem. These questions need to be raised and carefully considered against the benefits of using carbon nanotube packaging to help provide food for all around the world.

The cumulative impact of nanosilver antibacterials across the human life cycle

Nanosilver is widely used to protect clothing, food packaging, and refrigerator linings, especially during trucking and food transport. One facet of this miracle for transport, however, remains understudied: the impacts of possible nanosilver migration caused by contact transmission, when protected surfaces on tables, counters, plates, and machines come in contact with food. Like carbon nanotubes, the ability to use nanosilver has important implications for distribution, to ensure that everyone in the world has access to food.

CONCLUSION: BRIDGE THE INTERNATIONAL TRADE GAP CAUSED BY NANOMATERIALS IN FOOD

In conclusion, nanotechnology involves small materials, but it raises big governance questions. The Big Picture of nanoscience's impact on global food health provides several important new tools to fight starvation in the future. Nanostructures in food pose challenges regarding an unquantifiable risk. Globalization of food commerce is far too multi-layered and complex to enable manufacturers and vendors to exclude products based on the presence of TiO₂ and the requirements of regulations at their destination, even though there is extensive niche marketing for food. EFSA's recent request for stakeholder comments in February 2025 [7] represents an important recognition of the legal scholarship that praised this pioneering regulatory work. This shift in emphasis from expertise to politics reflects a new understanding that EFSA rules that rely on robust science as guidance represent an effort to reconcile existing practice with US law. EFSA will review its stakeholder input, and the FDA Gras list will be scrutinized for the first time in decades. Globally, international trade and human health concerns raise several legal questions that can best be answered by a transatlantic commission. Scientists and governments agree that there are unquantifiable, presently unknown risks associated with the applications of nanotechnology in consumer products. The first step towards mapping a solution for the differences between USA and EU laws to resolve the conflict of laws concerning the use and limits of nanostructures in food requires that each side soften its approach to these differences and produce coherent global health policies that offer predictable approaches for trade agreements shaping international commerce. Regulatory changes on both sides of the Atlantic support this new direction, a first step toward eventual harmonization of these laws.

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18. US Congress, Food, Drug, and Cosmetic Act 21 U.S.C.A. § 301 et seq. Section 201(f) of the Act defines "food": "The term 'food' means (1) articles used for food or drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article."

19. US Congress, Food, Drug, and Cosmetic Act 21 U.S.C.A. § 301 et seq. 1960 Amendments: Color Additive Amendments define the term "color additive" Section 201(t) of the Food Drug and Cosmetic Act (FD&C Chapter I--Food And Drug Administration Department Of Health And Human Services Subchapter A General Part 73 -- Listing Of Color Additives Exempt From Certification subpart A – Foods (A) Identity.

20. US Congress, Food, Drug, and Cosmetic Act 21 U.S.C.A. § 301 et seq. Subchapter A General Part 73 -- Listing Of Color Additives Exempt From Certification subpart A – Foods (A) Identity. 1) The Color Additive Titanium Dioxide Is Synthetically Prepared TiO₂, Free from Admixture With Other Substances. (c) Uses and restrictions. The color additive titanium dioxide may be safely used for coloring foods generally, subject to the following restrictions: (1) The quantity of titanium dioxide does not exceed 1 percent by weight of the food.

21. US Congress, Food, Drug, and Cosmetic Act 21 U.S.C.A. § 301 et seq Chapter I--Food And Drug Administration, Department Of Health And Human Services, Subchapter A General Part 73 -- Listing Of Color Additives Exempt From Certification.. 721 of the FD&C Act (section 402(c) of the FD&C Act). Under 21 CFR 70.3(i)

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