Ethics of Comparative Policies for Food Preservatives in Europe and America

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***Abstract*—Food preservatives are commonly used to extend shelf life and reduce food waste in modern food systems. However, their widespread use has raised ethical concerns due to potential links to long-term health effects, including cancer and hormonal imbalances. While preservatives are used globally, regulatory approaches differ substantially. The United States permits the use of a significant amount of food preservatives compared to Europe.**

This paper examines the ethical implications of food preservative regulation through a comparative analysis of United States and European policies, specifically how differing regulatory frameworks shape consumer exposure to preservatives and influence public health outcomes. Ethical issues surrounding consumer autonomy and choice are central to this analysis, particularly due to information imbalances between food companies and consumers. Complex labeling practices, limited public understanding of additive risks, and the influence of the food industry on policymakers may restrict consumers' ability to make fully informed decisions about the foods they consume. The methodology integrates policy analysis, peer-reviewed health literature, and ethical evaluation principles. Regulatory documents from U.S. and European agencies are examined alongside existing research on preservative-related health risks. Ethical frameworks, including utilitarian reasoning and principles of autonomy, are applied to evaluate whether current regulatory approaches adequately balance societal benefits and potential harms.

This analysis aims to evaluate whether the extensive use of preservatives in the United States can be ethically justified by comparing claims about reduced food waste and increased food availability with potential long-term health risks associated with preservative exposure. It also examines how information imbalances between food companies and consumers, along with the influence of the food industry on policymakers, affect consumer autonomy and ethical accountability within food regulation. By comparing U.S. and European regulatory approaches, this work aims to clarify the ethical trade-offs embedded in preservative policy and identify whether current practices adequately balance societal benefit, consumer choice, and public health protection.

Keywords- food preservatives, regulatory policy, consumer autonomy, public health, United States, European Union, ethical analysis, information asymmetry

I. Introduction

Modern day food systems maintain a huge reliance on chemical food preservatives to allow for large-scale food dispensation, spoilage reduction, and shelf-life extension. These additives have an integral role in food waste reduction and food availability. However, the level of usage, especially when comparing usage in the US and European Union (EU), is starting to raise concern amongst critics. The US currently permits 33 times the amount of food preservatives than in the EU, creating drastic exposure level differences amongst both populations in their everyday diets [1]. Research has shown that additives such as nitrates, sorbates, emulsifiers, and other common preservatives are linked to negative health outcomes [2]. These health risks can include higher cancer risk and unhealthy gut microbiota levels when these additives are ingested in everyday diet over a long period of time[3]. Research studies prove that cumulative exposure to preservatives contribute to public health risks.

Due to the huge difference in food preservative permittance, policy approaches to food additive regulations differ drastically in the US compared to the EU. The US utilizes more of a risk-based regulatory framework compared to the EU which utilizes a precautionary, hazard-based approach [4][5]. A risk-based regulatory framework consists of allowing risk within permitted substance usage if that risk falls within an acceptable range. A precautionary, hazard-based approach focuses on restricting substances if they impact long term safety. These vastly different frameworks for consumer protections represent the contrasting priorities between the US and EU when it comes to long term health and economic efficiency. This raises ethical concerns pertaining to the unequal protection of public health and consumer safety across populations.

The scale and wide spread distribution of food preservatives amplifies the significance of this issue. Most people consume these food preservatives daily, with disproportionately higher levels in low-income populations and children due to a greater reliance on cheap, processed food options in those populations. It is critical to evaluate and compare ethically the current regulatory policies in the EU and US due to potential widespread long-term health impacts. Long term health impacts include increased chronic disease development and healthcare system burden [6][7]. Additionally, poor labeling transparency and public understanding of food preservative risks prevent consumers

from knowingly making informed decisions, further raising ethical debate on consumer autonomy and informed consent [8]. The collection of these concerns collectively demonstrate the necessity to assess whether current EU and US frameworks adequately balance societal benefits, such as food accessibility, with ethical obligations to protect public health.

This paper analyzes the ethical implications of food additive policies through a comparative analysis of US and EU frameworks. This approach will evaluate how differing regulatory frameworks influence consumer exposure, public health consequences, and the dispersion of risks across populations. By applying ethical frameworks including utilitarianism, principlism, and the precautionary principle, this analysis aims to decide whether current practices can be ethically justified and to identify alternatives toward more balanced and responsible food system design.

II. Findings

The regulatory divide between the United States and the European Union over food preservatives is not incidental; it reflects fundamentally different foundational philosophies toward risk and uncertainty. The EU's General Food law, established following the bovine spongiform encephalopathy (BSE) crisis in the 1990s, formalized the precautionary principle and enabled regulators to restrict or ban food substances even in the absence of conclusive scientific proof of harm [9]. The European Food Safety Authority operates under this mandate, requiring extensive pre-market safety data before any preservative or additive may be approved, and typically banning substances where scientific uncertainty persists [10].

The United States, by contrast, anchors food additive regulation in the Food Additives Amendment of 1958, which holds that substances may be used unless the FDA determines they are unsafe, placing the burden of proof on regulators rather than manufacturers [11]. This risk-based approach evaluates the actual likelihood of harm under typical conditions of use and exposure levels, rather than restricting substances on the basis of theoretical hazard alone [12]. Critically, the 1958 Amendment also created the "Generally Recognized as Safe" (GRAS) exemption. This exemption was originally intended for common ingredients such as salt, vinegar, and yeast, but has since become a structural loophole that enables manufacturers to self-certify novel chemical additives without mandatory FDA review or disclosure [13].

The consequence of this regulatory divide is a stark numerical disparity: approximately 10,000 food additives are approved for use in the United States, compared to roughly 411 in the European Union, with hundreds of substances permitted in American food products that are banned or restricted across the Atlantic [14].

The GRAS framework has created a significant and measurable gap in consumer protection. Under a 1997 voluntary notification system, manufacturers can introduce new substances into the food supply without informing the FDA, let alone obtaining agency approval. An analysis by the Environmental Working Group found that since 2000, nearly 99% of new food chemicals have entered the market not through FDA pre-market review, but through industry self certification under the GRAS pathway [15]. This system has also limited the FDA's visibility into the full range of substances in the food supply, as some ingredients may be introduced without disclosure or review, leaving their use and safety unknown to regulators and the public. At the same time, existing research links certain permitted food additives to potential health risks, including cancer and developmental harm [11].

Numerous examples illustrate the practical consequences of this gap. Brominated vegetable oil (BVO), a preservative used for decades in citrus-flavored drinks such as Mountain Dew and Gatorade, was banned in the European Union on safety grounds years before California moved to restrict it in 2023 [11]. Similarly, potassium bromate, a dough conditioner associated with potential carcinogenicity, is banned in the EU, Canada, China, and Japan, yet continued to be permitted in the U.S. until California's recent ban drew renewed federal attention [11]. In Europe, sodium nitrite (E250) and sodium nitrate (E251) in cured meats have strict usage limits and mandatory warning labels due to concerns over nitrosamine formation; the U.S. permits more liberal use without equivalent labeling requirements, driven more by consumer preference trends than regulatory mandate [10].

These divergences shape consumer exposure profiles in meaningful ways. American consumers are more likely to encounter preservatives and additives that have not undergone independent government safety review, while European consumers face a more restrictive environment that may occasionally forgo beneficial food innovations in the name of precaution [9].

Neither regulatory approach is without public health costs. Advocates of the EU's precautionary model argue that early restriction of uncertain substances prevents cumulative harms that may not become scientifically demonstrable until after widespread population exposure [16]. The U.S. case of trans fats, which remained in widespread use for decades under GRAS status before being formally banned in 2018, supports this concern [17]. The GRAS system's reliance on industry-funded safety panels, which a 2013 investigation found to have conflicts of interest, further undermines confidence in the impartiality of U.S. safety determinations [18].

At the same time, critics of the precautionary principle note that blanket restriction of substances on the basis of theoretical hazards can itself produce harm. When a preservative is banned, a replacement must be found and that substitute may carry its own, potentially greater, risks that have simply not yet been evaluated [12][19]. The EU's approval of cyclamate, a sweetener banned in the U.S. since 1969 based on cancer data, illustrates that precautionary and risk-based systems can also reach opposite conclusions from the same evidence base [12].

Collectively, these findings illustrate that differences in regulatory structure translate into measurable differences in exposure, oversight, and potential public health risk between the United States and the European Union.

III. Ethical Theories and Analysis

The use of food additives has many objectives, ranging from adding color, extending shelf life, and helping lower costs. Despite these goals, the priority should be to ensure the food is safe for consumers. With there being over 10,000 different additives allowed in the United States, and 300-400 in the EU, it raises questions if all of these additives are safe for consumption [8][20]. In the United States, the ability to mass-produce additives is significantly more lenient than in Europe. Although the FDA is responsible for making sure additives are safe for consumption, this doesn't always happen. This is due to generally recognized as safe(GRAS) ingredients not having to go through the FDA. This allows companies to do research and determine independently, without input from the FDA, if the ingredient is GRAS [21]. Utilitarianism is often used to defend the amount of additives due to their benefits. Most additives are used to preserve the shelf life of food, causing less food waste, but they often disregard the long-term effects of additives. In contrast, in Europe, they follow the precautionary principle, meaning that if the substance has a chance of causing harm even without 100% certainty, steps are taken to eliminate the risk. The goal of the European Food Safety Authority is to prevent harm before it happens. This is effective because additives in Europe are only used if they are guaranteed to be safe, unlike in the United States, where this principle isn't used.

Another difference is that in Europe, there are warning labels when a certain additive is used, including its effects. The most commonly recognized additive is Red 40. An additive that has been linked to have an adverse effect on activity and attention in children is labeled in Europe but not in the United States[22]. This demonstrates the high ethical standards that are placed in Europe. Labels such as the one above allow customers to make an informed decision about what they are putting into their bodies. In the United States, without such labels, and you truly say that we understand what we're putting in our bodies? This exact principle connects to one of the 4 principles of Autonomy, stating that customers should know what they're eating. Without labels that allow consumers to make informed decisions about what they are putting into their bodies.

In addition to utilitarian and precautionary mediations, this problem can be looked at from the point of view of engineering ethics as well. One of the National Society of Professional Engineers (NSPE) Code of Ethics fundamental cannons states that engineers must “hold paramount the safety, health, and welfare of the public” and must also be truthful and transparent in professional communication [23]. Under this engineering ethics framework, inadequate labeling practices for food preservatives and minimal public explanation of preservative risks calls into question whether these ethical standards are currently being upheld by engineers. When consumers are not given clear and accessible information about the potential long-term effects of food additives, they lose their ability to make informed decisions, which conflicts with the ethical responsibility to prioritize public welfare and transparency. This also reinforces the ethical issue of inadequate labeling not only as a means of limiting consumer autonomy but also a potential violation of professional ethical standards that require honesty, accountability, and the protection of public health.

Relying on industries to self regulate and the GRAS pathway also further conflicts with ethical considerations. If companies are able to dictate the safe usage of food preservatives without independent review, a conflict of interest forms within balancing economic gain and consumer health protection. From an engineering ethics standpoint, this raises questions on whether there are adequate regulations to ensure that consumer safety is prioritized over economic efficiency and cost reduction. In contrast, stricter regulatory frameworks that emphasize precaution and transparency more closely align with the NSPE Code by proactively minimizing harm and ensuring that the public is adequately informed.

A. Stakeholders

The ethical challenges associated with food preservative use involves multiple stakeholders whose responsibilities, interests, and goals differ. This difference is recognized and affects each group, which in turn causes differences in opinion on policies when it comes to regulations. Some stakeholders include the consumers (general public), regulatory agencies, scientists, and the food industry in its many sectors. Their role is central in evaluating ethical responsibility in the modern food system.

The food industry includes the manufacturers, distributors and retailers. They benefit from the use of preservatives in their products through extended shelf life, reduced waste, and increased stability[8]. Stricter regulations would negatively impact this sector due to costs and operational impacts, causing a resistance amongst this industry. This results in a balance between economic incentives and ethical responsibilities to minimize harm.

Scientists include researchers of public health and food preservatives. This also includes formulators of various food products. They research both the benefits and detriments of the use of food preservatives. They have the ability to further research the long-term health impacts of preservatives. They are contributors towards the making of evidence-based policy decisions[3]. However, their influence on integration into policy and independence from industry funding and bias remains unknown.

Regulatory Agencies include the Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), and the EU. They are directly responsible for establishing and enforcing food safety standards. Their roles force them to navigate the balance between economic consideration and the need to prioritize public health[5]. Their various approaches determine acceptable risk levels and evaluate scientific evidence related to long-term health outcomes.

Consumers, or the general public are the primary population affected by food preservatives. They rely heavily on the aforementioned regulatory systems and labeling practices to make informed dietary choices[8]. However, they often

experience limitations due to complex ingredient listings and inadequate risk communication. Within a broader group, vulnerable populations face additional risks due to limited access to fresh foods. This is linked to a heavier reliance on processed foods, therefore increasing preservative exposure. These disparities highlight ethical concerns related to equity, autonomy, and informed consent[8].

Together these stakeholders demonstrate the complexities surrounding the ethics of food preservative use. As the central power in evaluating food systems, each group holds differing views and varying degrees of power in shaping the outcomes related to public health and wellbeing.

IV. Alternative approaches

Differences in the EU and US usage of preservatives leads to a variety of ethical concerns, although a clear solution does not exist. As previously discussed, the U.S. uses a risk-based system that emphasizes acceptable exposure levels while the EU uses a precautionary model which prioritizes early restriction[24]. As a result, neither framework fully resolves the concerns surrounding consumer autonomy, regulatory accountability, and long-term health risks. However, alternative approaches exist that range across technological innovation, regulatory policy, and food system design that emphasize a balance of public health, food accessibility, and ethical responsibility[25].

One approach involves replacing familiar synthetic preservatives with plant- or microbe-derived antimicrobial agents. These alternatives have demonstrated effectiveness in extending shelf-life while reducing exposure to the chemicals commonly associated with long-term health risks[26]. This approach actively minimizes the harm to consumers, however limitations still remain. Natural preservatives often mean higher production costs, reduced chemical stability, and difficulties in scaling during manufacturing. This considerably limits feasibility within industrial systems.

A second alternative builds upon the European approach by adopting stricter, precautionary based regulation. This prioritizes prevention over acceptable exposure by reducing exposure rather than relying on the individual to manage risk [8]. This also means that substances may be banned or restricted in the absence of scientific proof of harm. As a result and limitation, these restrictions may raise production costs, disrupt supply chains, and reduce food availability. While one ethical concern is reduced, another is raised in regards to equity and access.

Another approach focuses on improving labeling to promote risk communication and transparency to the consumer. For example, the U.S. often uses chemical nomenclature with limited contextual information, contributing to a communication gap between food producers and consumers[4]. Therefore, the use of simpler labeling systems and clearer communication of potential risks would aid in informed decision-making by the consumer. This approach alone however, is not enough to completely solve ethical concerns as it assumes consumer engagement and understanding that may not be consistent across populations.

A more systematic approach could be taken that involves reducing the reliance on processed foods altogether. For distributors, this would mean promoting fresher food options and shorter supply chains. As preservatives are most often used in processed, long-shelf-life products, this approach addresses the root of additive exposure rather than regulation attempts. It offers a more overarching path to reducing harm, nonetheless, it comes with its own challenges. Modern systems rely on preservation to ensure affordability, convenience, and global distribution. A deviation from processed foods may affect populations with limited access to fresh alternatives, raising ethical concerns of equity and accessibility.

Collectively, the alternative approaches listed illustrate the inherent trade-offs between safety, cost, innovation, and consumer choice. These approaches, along with strengthening long-term testing, have the ability to solve ethical concerns related to food preservatives[24]. However, their varying use reflects differing ethical priorities and demonstrates that no one solution can fully address this compound issue. Alternatively, they highlight the need for an integrated, adaptive strategy that not only incorporates elements from the approaches listed, but also from the regulations currently in place in the U.S. and EU. This would allow for a balance of public health protection and the practical realities of modern food systems.

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