Unseen Consequences: The New Report on Foie Gras, Human Health, and Ecological Impact

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Abstract—**This study highlights the potential risks associated with foie gras production and consumption. Foie gras consumption has been linked to diseases such as amyloidosis, listeriosis, and campylobacter infections, posing serious public health concerns. The process of producing foie gras, which involves force-feeding birds to enlarge their livers beyond natural capacity, not only causes animal suffering but also contributes to environmental degradation, including harmful algal blooms. Research has shown that foie gras contains some of the highest levels of flame retardants, which are known to cause endocrine disruption and other health issues. Additionally, the intensive fattening requirements of foie gras operations contribute to the spread of zoonotic diseases like avian influenza, raising both public health and biodiversity concerns. Because waterfowl, like ducks and geese used in foie gras production, are the natural reservoirs for avian flu, they can be asymptomatic carriers. The Highly Pathogenic Avian Influenza (HPAI) virus is the most likely candidate for the pandemic among humans. Given the negative effects on public health, ecosystems, and personal experience of the animals, divergence from foie gras production and consumption is recommended.**

Keywords—**amyloidosis, avian influenza, listeria, HPAI, force-feeding, zoonotic spillover, flame retardants, gavage, campylobacter**

I. Introduction

Foie gras, a food product composed of the liver of a duck or goose that had been force-fed in order to achieve an increased weight, has long been investigated for animal welfare violations inherent in its production. The process requires gavage, which is force-feeding the birds 20–30% of their body weight in one sitting, two to three times a day. The birds' livers naturally weigh around 40–50 g, but regulations demand a minimum of 300 g. This swelling not only causes severe pain and suffering for the birds, but emerging data suggests it also has detrimental impacts on ecosystems and significant consequences for human health.

The reason for this investigation was a June 21, 2024 ruling in *Matter of City of New York v. Ball*, in which the New York State Supreme Court overturned New York City's local law banning the sale of foie gras. The Court found that the law was adopted to address ethical concerns about animal treatment, rather than threats to public health or safety, and therefore unlawfully restricted agricultural operations under state law. The case prompted further review of foie gras production to evaluate whether credible ecological and human health risks have been overlooked in prior regulatory and legal assessments.

This report highlights recent findings related to foie gras, linking its consumption and production to potentially fatal health hazards, environmental degradation, and zoonotic disease transmission. Compiled of over 70 studies or reports, the evidence suggests that the consequences of foie gras need to be further examined and addressed to safeguard future generations.

II. Literature Review

This study investigates the interconnected health, ecological, and bodily effects of foie gras production and consumption, exploring the risks posed by the fattening process and the associated impacts on both humans and animals. The central hypotheses guiding this research include: 1) intentionally fattening ducks increases bodily fluids, which in turn increases the opportunity of transmission of Highly Pathogenic Avian Influenza (HPAI) and other viruses and bacteria; 2) consumption of inflamed livers may have detrimental effects on human health; and 3) birds used in modern foie gras production experience painful bodily effects due to being force-fed. These hypotheses are examined through a comprehensive review of existing literature, which considers public health, biodiversity, or welfare concerns regarding the intentional fattening of waterfowl.

A. Effects on Human Health

Foie gras has been linked to diseases such as amyloidosis, listeriosis, and campylobacter infections. Foie gras also contains high concentrations of brominated phenols—flame retardant chemicals known to disrupt human endocrine systems, posing even further health risks. European Union [1] standards require an enlargement from about 40 g to a minimum of 300 g. Waterfowl used in foie gras production are reservoirs for HPAI and other viruses, which the Global Center for Health Security at the University of Nebraska Medical

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Center reports in "Bird flu has a heat-proof gene that protects it from our fever defenses" [2], as being very dangerous in humans because unlike humans, the birds' "normal body temperature sits between 40 °C and 42 °C (104 °F and 108 °F), and avian influenza viruses—including the highly pathogenic strains that occasionally spill over into humans—have evolved to replicate efficiently in that heat." Because the livers are compromised during the unnatural engorgement, they metabolize hazardous compounds less efficiently, allowing buildup to occur.

B. *Avian Flu Spillover: Human to Human Variant*

Waterfowl, like ducks and geese used in foie gras production, are the natural reservoirs for HPAI. Research by Yuen and Wong [3] highlights that this virus is the most likely candidate for the next influenza pandemic among humans and could cause another worldwide shutdown: "A mutant or reassortant virus capable of efficient human-to-human transmission could trigger another influenza pandemic".

A report by the Center for Infectious Disease Research and Policy (CIDRAP) [4] confirms that HPAI can spread to humans through direct contact with infected birds, contaminated environments, or by consuming raw or undercooked duck organs. Artificial concentrations of ducks and other waterfowl, such as foie gras farms, create ideal conditions for new mutations to develop and spread quickly amongst the birds. Rapid generational turnover accelerates mutation rates, and because asymptomatic carriage in ducks is common, it allows the virus to spread to jump to other species, potentially undetected. The World Organization for Animal Health (WAHIS) [5] reported a new strain of the virus-H5N9-outbreak occurring at a California duck farm as recently as January 2025, exemplifying how these facilities accelerate mutations with unpredictable behavior.

Recommendations from industry influencers such as D'artagnan [6] and Ernest Soulard [7], spotlight that foie gras consumption can play a unique role in the transmission of HPAI and other harmful pathogens due to needing lower cooking temperatures to prevent compromise of the fatty texture. Despite "CDC" [8] guidance that poultry products must be cooked to an internal temperature of 165 °F (73.8 °C) in order to eliminate avian influenza risk, foie gras is routinely cooked to much lower temperatures, between 118 °F (48 °C) and 131 °F (55 °C).

The United States Department of Agriculture (USDA) and Animal and Plant Health Inspection Service (APHIS) [9] report HPAI has now been detected in at least 49 mammal species including minks, sea lions, foxes, polar bears, and even domestic cats. Further reports by CIDRAP [10] show evidence of spread on mink farms in Spain and Finland that, according to Resolve to Save Lives (RSL) [11], required the mass culling of over half a million animals on over 70 farms. The Government of British Columbia [12] reported similar outbreaks of SARS-CoV-2, prompting an industry prohibition. Many countries took similar action because research published by health authorities like the National Institute of Health (NIH) [13] exposed minks' ability to mutate the virus and spill it back over to humans. In 2023, researchers Kim *et al.* [14], linked shelter cat deaths to avian influenza-contaminated raw duck, exposing the possibility of cross-species food-borne transmission and emerging pandemic risk. Ducks can asymptomatically shed the virus for 3 or more weeks. As the virus continues to mutate, the risk of a zoonotic spillover into humans becomes higher. Foie gras consumption sites could be potential conduits in the emergence of human infection.

C. *Amyloid Exposure Immune Response: A Potential Biohazard*

The high concentration of amyloid fibril plaques common in captive waterfowl is one of the most impactful because, according to scientists at the Department of Biosciences and Nutrition [15] in Sweden, they are linked to the pathogenesis of Alzheimer's with potentially fatal reactions in immunocompromised groups. Elsevier [16] defines amyloids as misfolded, insoluble proteins that when in a state of amyloidosis, can be abnormally deposited within extracellular space and blood passageways, restrict cerebral blood flow, and cause organ failure. Studies performed by Korenaga *et al*. [17], concluded that accelerated amyloid development occurs after oral exposure to products with amyloid content. The researchers also found that maternally transferred amyloid fibrils through milk lead to early onset amyloidosis. According to Solomon *et al*. [18], Pekin ducks, a breed typically used in foie gras production, are predisposed to high accumulation of amyloids. Veterinarians [19] report that this biological abnormality increases in birds subjected to stressful environmental experiences like over crowding or fattening. Post-mortem analysis of the birds by Dr. Christal Pollock [20] confirms that most amyloid deposits are predominantly deposited in the liver, with captive waterfowl experiencing much higher rates of amyloidosis than wild birds. Researchers [18] found that consuming Amyloid Enhancing Factor (AEF) fibril seeds leads to hazardous amyloid production and buildup in the consumer, and that even cooking could not completely abolish the AEF activity of foie gras.

Because limited knowledge publicly exists on the immune responses of amyloid consumption, accurate reporting of symptoms is unlikely, creating a heightened risk and decades of build up. Data released by the Alzheimer's Association [21] show 1 out of 9 people over 65 have Alzheimer's in the U.S., but in France, recorded by Statista [22] as the world's largest consumer of foie gras, Institut Pasteur [23] reports the frequency as 1 out of 4. The rate of Alzheimer's in seniors can be seen as 125% higher in France compared to the USA.

To illustrate the increased saturation of foie gras consumption in France versus the USA, we compared per capita consumption:

- France: 16,000 metric tons consumed annually by a population of 68.17 million = 0.234 kg per person per year.

- USA: 300 metric tons consumed annually by a population of 334.91 million = 0.0009 kg per person per year.

This shows that foie gras consumption is over 260 times higher per capita in France than in the USA, highlighting its much deeper cultural enmeshment.

Scientists [18] suggest individuals with inflammatory illness avoiding consumption of amyloidogenic foods due to potentially life-threatening reactions:

- Alzheimer's Disease: Research suggests a link between amyloid proteins and the development of neurodegenerative conditions. Consuming amyloids could contribute to cognitive decline or exacerbate existing symptoms in those predisposed to Alzheimer's.
- Asthma: Consumption of amyloids may trigger respiratory inflammation, leading to increased asthma attacks and complications.
- Rheumatoid Arthritis: Eating amyloids may exacerbate inflammation and joint pain.
- Irritable Bowel Syndrome (IBS): Amyloids can disrupt gut health, potentially aggravating symptoms like abdominal pain and altered bowel habits.
- Other Inflammatory Illnesses: For individuals with general inflammatory conditions, eating amyloids may provoke heightened immune responses, leading to increased inflammation and discomfort. In certain situations, these immune responses can prove fatal, particularly for those with compromised health or underlying conditions.

D. Listeria Contamination and Health Risks

Industrial foie gras production and consumption carry significant risks of contamination with Listeria monocytogenes, defined by the U.S. Food and Drug Administration [24] as a disease-causing bacterium that can survive chilling and lead to Listeriosis. Most ducks and geese raised for foie gras are kept in high density, unsanitary conditions, where exposure to fecal waste and other bodily fluids is nearly constant. Because the animals suffer repeated capture, tube-feeding, and other physical/mental stress in these artificial environments, their immune systems compromise and they experience reduced functionality of the liver, contributing to higher contamination levels. This is an ideal environment for Listeria to proliferate, especially in the birds' livers.

People infected with *L. monocytogenes* can start to see symptoms in a few hours, or as long as two to three days after eating contaminated food (see Fig. 1). More severe forms of listeriosis may take anywhere from three days to three months to develop. Symptom onset delays paired with traditional consumption recommended by food specialists [25] to include alcohol with foie gras confusing symptoms elevate the unlikelihood of accurate reporting of illness directly related to consumption. This creates a heightened risk for consumers with potentially fatal consequences.

L. monocytogenes bacterium is particularly dangerous because it can survive and even grow at refrigerated temperatures, making it a serious threat in ready-to-eat products like foie gras, which often undergo no further cooking or sterilization before consumption, increasing the likelihood of listeriosis outbreaks. According to research by Vázquez-Boland *et al* [26], pathogenic Listeria primarily enter the host through the intestine, with the liver being their first target after crossing the intestinal barrier. Within the liver, Listeria bacteria actively reproduce, leading to high concentrations. Mild symptoms may include a fever, muscle aches, nausea, vomiting, and diarrhea. If the more severe form of listeriosis develops, symptoms may include headache, stiff neck, confusion, loss of balance, and convulsions. Officials [24] report that for pregnant women, children, the elderly, and the immunocompromised, listeriosis can result in death.

Populations at highest risk include:

- Pregnant Women: Listeria can cross the placenta and infect the fetus, leading to miscarriages, stillbirths, and serious infections in newborns.
- Immunocompromised Individuals: People with weakened immune systems, including those undergoing chemotherapy, organ transplant recipients, and individuals with Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS), are at a significantly higher risk of severe listeriosis. For these individuals, even small amounts of Listeria can lead to serious infections like meningitis, septicemia, and even death.
- Elderly Individuals: Age-related declines in immune function make older adults particularly susceptible to listeriosis. Symptoms in the elderly can escalate quickly to meningitis, encephalitis, and death.
- Children: Listeriosis can lead to gastrointestinal illness and, in severe cases, complications such as blood infections and brain inflammation. Fig. 1 shows the effects of exposure to listeria.

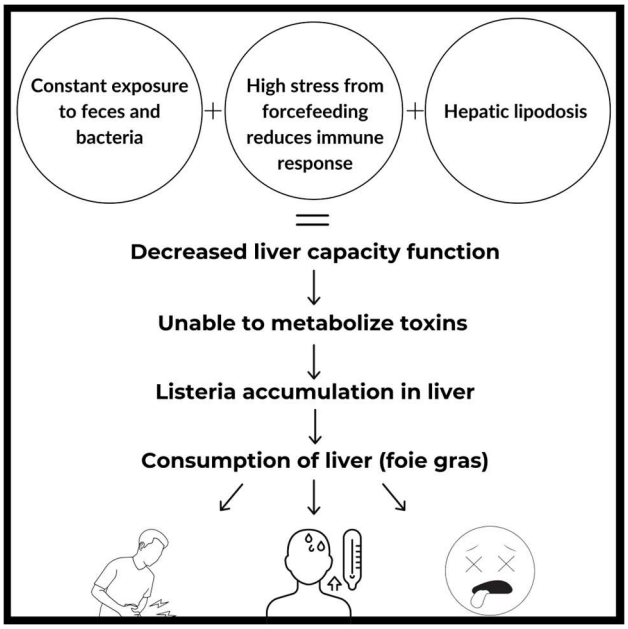

Fig. 1. Shows the effects of exposure to listeria.

E. Recent Outbreaks and Industry Response

The Washington Post [27] reported in September of 2024, a Boar's Head liverwurst plant in Jarratt, Virginia caused a fatal outbreak of listeriosis that resulted in at least ten fatalities and prompted the company to close the facility. At least one person died from listeria present on meat products outside of the liver. This outbreak highlights the imminent dangers of Listeria in liver-based products like foie gras, which are produced under similar conditions and carry similar risks of cross-contamination.

International public health officials, the Australian Food and Safety Department [28] classifies ready-to-eat liver pâtés, including foie gras, as a medium or high risk to public health due to Listeria concerns.

F. Flame Retardants in Foie Gras and Health Consequences

A 2019 study performed by Poma *et al.* [29] on flame retardant chemical concentrations in various foods throughout Belgium, showed that among products tested for brominated phenols (BrPhs-flame retardants), foie gras showed some of the highest levels of contamination. The maximum levels of 4-BP, a BrPh, were detected in duck foie gras, reaching 710 picograms per gram(pg), making it one of the most contaminated samples compared to other foods, such as salami (252 pg/g) or canned tuna (164 pg/g). For comparison, the mean concentration of the meat and meat products group was 77 pg/g, making foie gras nearly ten times more contaminated than the average land based meat product.

BrPhs like 4-BP are widely recognized for their harmful health effects. According to Feiteiro *et al* [30], these chemicals are carcinogenic, leading to several serious consequences:

1) Endocrine Disruption: Can interfere with hormone regulation, leading to reproductive and developmental issues. This disruption can impact growth, metabolism, and overall hormonal balance.
2) Thyroid Dysfunction: BrPhs are known to affect thyroid hormones, leading to altered function. This can cause significant health problems, including metabolic imbalances and cognitive impairments, particularly affecting vulnerable populations like children and pregnant women.
3) Neurological Impacts: Prolonged exposure to high levels of flame retardants may negatively impact brain development and function, leading to cognitive deficits, behavioral issues, and memory problems. These are particularly concerning for developing children.
4) Cancer Risk: According to Shen *et al.* [31], exposure to BrPhs is linked to an increased risk of cancer, specifically breast cancer. The persistent accumulation of these chemicals in the body over time raises concerns about the potential for long-term carcinogenic effects.

G. Campylobacter Infection

Campylobacteriosis is a zoonotic pathogen that can be transmitted to humans from animals while they show no signs of infection. These bacterial infections can be fatal for young children, the elderly, and immunosuppressed individuals. According to Ubeda Ruiz *et al.* [32], it is even associated with spontaneous miscarriage. Since foie gras is often consumed as a ready-to-eat or undercooked product, it poses a high-risk danger for vulnerable populations in developing Campylobacter gastroenteritis.

A Trakia University [33] study on campylobacter contamination across Bulgarian fattening farms found that foie gras ducks are very frequent carriers of Campylobacter (*C. jejuni* and *C. coli*), even after scalding, waxing, and chilling procedures. They found the bacteria in the intestines of the sampled birds 72.5% of the time, 12.5% on the skin, 12.5% in the foie gras, and 7.5% within the breast meat (magret).

The WHO [34] informs that Campylobacter infections typically develop 2 to 5 days after exposure and cause symptoms like diarrhea, abdominal pain, fever, and nausea, lasting up to 6 days. As discussed previously, likelihood of consumption paired with alcohol in addition to symptom onset delays can contribute to a lack of timely reporting and can increase the risk of severe cases or death.

Infection can lead to several consequences:

1) Gastroenteritis: The most common symptom is diarrhea, which can be watery or bloody, along with abdominal cramps, fever, and nausea. Symptoms typically appear 2 to 5 days after exposure and can last about a week.
2) Dehydration: Severe diarrhea can lead to dehydration, particularly in young children, the elderly, and immunocompromised individuals.
3) Reactive Arthritis: Some individuals may develop reactive arthritis, which can cause joint pain and swelling. This condition can occur weeks or even months after the initial infection.
4) Guillain-Barré Syndrome: Infection can trigger Guillain-Barré syndrome, a serious neurological disorder that leads to muscle weakness and paralysis. This condition may require hospitalization and intensive medical care.
5) Long-term Complications: Some individuals may experience post-infectious Irritable Bowel Syndrome (IBS) or prolonged gastrointestinal symptoms, including discomfort and altered bowel habits.
6) Increased Risk of Other Infections: A history of Campylobacter infection may increase the susceptibility to other gastrointestinal infections.

High campylobacter contamination rates in foie gras ducks combined with undercooking leads to outbreaks. Food Safety News [35] reported on such an outbreak in 2017 at Café Juanita in Kirkland, Washington where King County public officials issued a warning—"Foie gras has been linked to other Campylobacter outbreaks in the past, particularly when eaten raw or undercooked".

H. Effects on Biodiversity and Ecological Impact

Ducks and geese raised for foie gras are typically housed in intensive confinement, confined to sheds within a warehouse, or outdoors, in many cases hundreds of thousands annually. Typical U.S. foie gras operations produce an estimated 1.5 million gallons of wastewater per year, and according to Berg [36], conventional treatment is unlikely to eliminate all the viruses present in such an environment, increasing the risk of zoonotic disease spillover to wildlife and humans. Public Interest Research Group (PIRG) [37] reports that factory farm wastewater is a combination of urine, blood, feces, pathogens, pharmaceuticals, and heavy metals that destroys ecosystems and causes Harmful Algal Blooms (HABs).

I. Avian Influenza Impact on Biodiversity

The spread of Highly Pathogenic Avian Influenza (HPAI) is currently considered the biggest global pandemic affecting animals in the world, affecting hundreds of millions of farmed and wild animals. The 2020 strain affecting the globe since emerging in the Netherlands is known as the clade 2.3.4.4b of H5N1. Waterfowl, like ducks and geese used for foie gras, are the natural reservoirs for the disease and can rapidly spread it between themselves, other migratory birds, and now mammals. Experts [38] say because they can be asymptomatic and shed the virus for several weeks, chances of transmission on and off farm are high. Transport between the raising shed and fattening shed increases exposure. Staff and supply truck transportation accelerate the spread between commercial farming operations. In an article released by Radio Catskill [38], it's exposed that foie gras farmers distribute the duck waste for fertilizer for other crops, further exposing wildlife to the disease. Raptors, like owls, eat the infected smaller animals and become infected themselves. HPAI has been known to infect populations including chickens, turkeys, pheasants, various mammals such as cows, mice, rats, cats, goats, and wild animals like skunks, foxes, mink, seals, and even dolphins (see Fig. 2).

The ripple effect of this disease devastates wildlife and domestic animals alike, leading to mass cullings. In the U.S., the deadly impact of HPAI on chickens and other "poultry" is staggering. Since 2021, the "USDA" [39] has not only spent over $1 billion in efforts to remediate damages on farms affected by HPAI outbreaks, they've also recorded the mass culling of over 100 million chickens. In a June 2024 Nature article Kozlov [40] revealed over 80 dairy herds have tested positive for the virus, which is now showing up in milk samples on shelves for human consumption.

The 2.3.4 4b clade was spread across Europe through migratory birds and quickly exploded. The European Centre for Disease Prevention and Control [41] reported that out of 1022 continental outbreaks across Europe between December 2020 and February 2021, 334 occurred in one department, in one country—Landes, France—a foie gras production hot spot. WATTAgNet [42] reports that by August 2023, France, had over 1775 HPAI outbreaks. The news outlet [43] later reported in March 2024 infection had been found on a vaccinated operation. Additionally, in October 2023, the USDA [44] banned poultry imports from France and Hungary, the world's top two exporters, due to persistent safety concerns over HPAI. WattAgNet [45] shared since September 2024, the foie gras dense county of Bács-Kiskun in Hungary has reported over 100 outbreaks consisting of 77% of the entire nation. Researchers [38] in Bulgaria found that nearly 90% of birds on foie gras farms have tested positive for different variations of HPAI. These outbreaks demonstrate an irremediable challenge in control within this form of production.

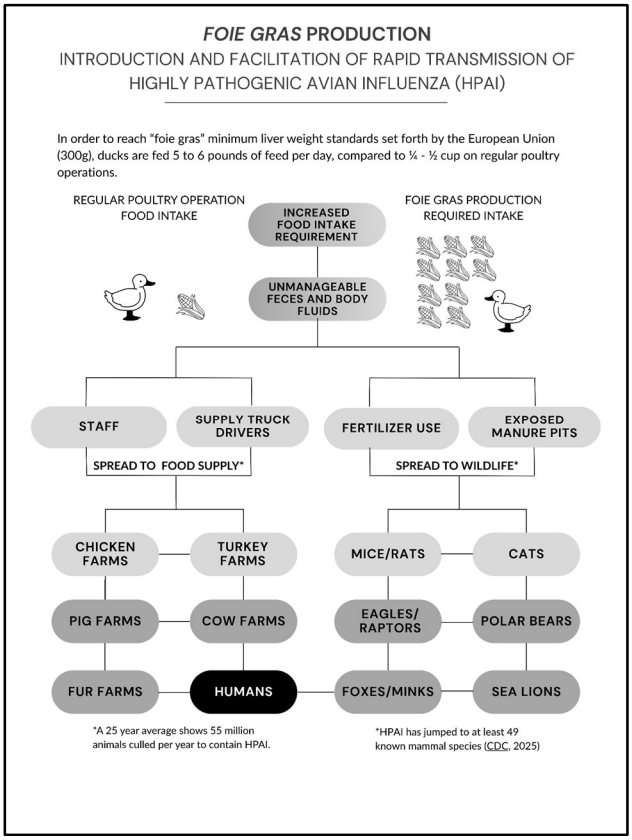

Fig. 2. Displays HPAI transmission pathways from foie gras production sites.

Bald Eagles, the symbol of American wildlife, are especially vulnerable to the virus. The USDA [46] reports that the total number of eagle deaths nationwide has reached 682 as of July of 2025. Eagles and other raptors are highly susceptible due to their predatory nature and likelihood of feeding on infected animals.

According to Yamamoto *et al.* [47], the virus can be shed from removed feathers for up to 15 days at moderate temperatures, up to 6 months if chilled. This creates another potential pathway for outbreak as foie gras duck feathers are transported to separate facilities following slaughter and exposed to new environments.

New mutations of H5N1 are still emerging; the Louisiana Health Department [48] announced the death of a man in January, 2025 due to a new variation called D1.1. The propensity to harbor, mutate and transmit various

versions of HPAI on foie gras farms implicates its production with dire retributions for life on earth.

J. Water Pollution and Ecological Harm

Production of foie gras also revealed negative effects on water quality and propensity for environmental degradation. The intensive fattening process, which requires much more feed than average farming, produces thousands of tons of nitrogen and phosphorus rich waste. In the 2020 publication "From Hogs to HABs: Impacts of industrial farming in the US on nitrogen and phosphorus and greenhouse gas pollution" Glibert [49] warns that nutrient pollution from industrial animal farms is hazardous to waterways, ecosystems and humans. Waste runoff fertilizes sea plants, bacteria in the waste feast on the organic matter, release neurotoxins and body heat as they metabolize, raising the temperature of the water. The bacteria reflects a blue-green color that absorbs sunlight and further increases the temperature. The warmer the water, the less dissolved oxygen. The algal bloom becomes so dense, that sunlight cannot reach the sea floor, making it so the sea grass or other plant life cannot photosynthesize, further contributing to eutrophication and hypoxia of waterways, causing system collapse. HAB related events have led to contamination of drinking water on several occasions and are even responsible for major fish kills at fishery operations.

Eutrophication is closely linked to the rising frequency and geographic spread of HABs in both freshwater and coastal marine environments. These events have been documented in every U.S. state, with recent examples impacting drinking water, causing fisheries closures, and raising public health concerns. Excess nitrogen and phosphorus have triggered a cascade of environmental, atmospheric, and human health problems, making nutrient pollution a major challenge to manage which according to the CDC [50], costs an average of $49 million annually.

Indicated by HumaneWatch [51] court documents from the 2010 case HSUS v. Hudson Valley Foie Gras, United States commercial foie gras operations are known to discharge approximately 5 million gallons of wastewater annually, and manage over 5000 tons of manure in outdoor lagoons. The waste from the ducks is sold as fertilizer for nearby crops, further increasing contact with the ground and water. The New York Department of Environmental Conservation [52] has reported that the Swinging Bridge Reservoir south of the U.S. foie gras farm reported 14 HABs since August of 2020. This highlights how an expansion of this industry would be devastating for local ecosystems.

K. Recent Event Impacts and Implications on Food and Supplies

HABs are increasingly causing significant damage to the food supply, including the aquaculture industry. Bangor Daily News [53] reports that a Cooke Aquaculture in Downeast, Maine experienced fish kill due to an algae bloom resulting in the deaths of thousands of salmon. This highlights the broader impacts of HABs, not only on ecosystems but also on food production, threatening both wild fisheries and aquaculture animals.

HABs are also a significant public safety risk because they can transmit harmful pathogens through the public water supply. Statesman Journal [54] reports in 2018, a toxic algae contamination occurred Salem, Oregon's water supply. Reporter Mayhew [55] summarized that in 2014, a toxin caused the Toledo Ohio water crisis, which left nearly half a million residents without safe drinking water. These events highlight how vulnerable drinking water systems are to HABs.

L. Effects on Personal Experience

Production of foie gras is predicated on a fallacy that the birds would naturally engorge themselves in preparation for migration. However, the modern industry standard of birds used in foie gras production are known to be non-migratory. The Comité Interprofessionnel des Palmipèdes à Foie Gras (CIFOG) [56] states about 95% of foie gras is produced using ducks, most often a "Mulard" which is a hybrid crossing of Pekin and Barbary (Muscovy) ducks. This verifies that the birds are subjected to cramming unnatural amounts of food they would not voluntarily ingest.

As stated by the President of Hudson Valley Foie Gras [57], there is no other way to produce a 300 g duck or goose liver aside from what is known as *gavage,* force-feeding, tube-feeding, cramming, over-stuffing, fattening, or hand-feeding. All the methodology is the same. Ducks would normally eat about 1/4 to 1/2 cup of food per day, but during the production of foie gras, they are force-fed 5 to 6 pounds. The resulting symptoms of cramming recorded by Experts [58] include: engorged, swollen livers (hepatic lipidosis), pain and injury from feeding tube insertion, fear and stress from handling, abnormal gait due to liver enlargement, limited respiratory capacity, liver dysfunction, and increased premature death. Operators [53] reported having to incentivize workers to reduce injury and deaths because they are so commonplace, highlighting the brutality of the process.

During the fattening stage, Skippon [59] reports the mortality rate in force-fed birds is 10 to 20 times higher than in non-force-fed birds. Repeated force-feeding involves restraining the birds, rapidly inserting a feeding tube, and expanding the esophagus, which can cause discomfort, aversion, and a risk of esophageal injury and pain. Since geese and ducks lack a crop, the increased feeding before and during force-feeding leads to anatomical and physiological changes, including esophageal expansion, increased heat production, decreased respiratory capacity, panting, and the production of semi-liquid feces. They often die from overheating, ruptured organs, punctured necks, hyperventilation, or bacterial infection.

Scientists Beausoleil and Lehmann [60] report humans and ducks have similar genetic expressions in pain reception called nociceptors that trigger neural activity in response to painful stimuli. Nociceptors are found on the skin, ankle joints, skeletal muscles, nasal and oral epithelium, and other beak structures of waterfowl. Tours by investigators [61] show the animals avoiding the feeding tube and handler, indicating adverse association.

Studies [55] show that if ducks are allowed to live beyond the gavage period, they will voluntarily abstain from feeding for three days or longer, indicating that the birds are force-fed beyond voluntary capacity.

M. Alternatives Exist

Alternatives to foie gras exist and offer humane and environmentally friendly options, allowing consumers to enjoy similar flavors without the associated harm. By adopting such alternatives, businesses can reduce the environmental footprint, protect public health, and promote animal welfare. Companies like Nestlé [62] and more have developed plant-based or cultivated products.

1. Voia Gras
2. Koji Foie Gras by Prime Roots [63]
3. Gourmay [64]
4. Faux Gras by GAIA [65]
5. Fuah by Hello Plant [66]
6. Le Fou Gras by Le Grand Bluff [67]
7. Noix Gras by Tobias Buholzer [68]
8. VEG'Gras by Senfas [69]
9. Vegan Foie Gras by Dr. Foods [70]
10. Foi Green [71]

N. Global and Domestic Policy Responses

Several countries have already taken decisive action to mitigate the risks associated with foie gras. According to Four Paws [72], 22 European Union member nations, along with two regions in Belgium, the United Kingdom, India, Australia, Turkey, Israel, Argentina, and in the U.S.; California, Pittsburgh, Pennsylvania, and Brookline, Massachusetts.

Policies affecting the United States

- California [73]
- Pittsburgh, Pennsylvania [74]
- Brookline, Massachusetts [75]
- IKEA [76]
- Whole Foods [77]
- Mom's Organic Market [78]

O. Global Policy

29 Countries have banned or phased out foie gras sales, production, and/or import:

1. Turkey [79]
2. Australia [80]
3. Israel [81]
4. India [82]
5. Argentina
6. Austria
7. Belgium (Wallonia and Brussels regions)
8. Czechia
9. Denmark
10. Finland
11. Germany
12. Ireland
13. Italy
14. Luxembourg
15. Netherlands
16. Poland
17. Slovakia
18. Sweden
19. United Kingdom (prior to Brexit)
20. Estonia
21. Greece
22. Bulgaria
23. Croatia
24. Cyprus
25. Latvia
26. Lithuania
27. Slovenia
28. Romania
29. Malta [83]

III. Result and Discussion

The results of this investigation strongly support all three hypotheses and demonstrate that foie gras production creates multifaceted risks that extend across infectious disease dynamics, human health outcomes, ecological integrity, and animal welfare. The findings also show that these impacts interact cumulatively, amplifying overall harm and revealing systemic vulnerabilities in both public and environmental health infrastructures.

A. Increased Bodily Fluids and Enhanced Pathogen Transmission

The evidence confirms that intentional fattening of waterfowl measurably increases bodily fluids and physiological stress, creating optimal conditions for pathogen propagation. The processes of housing, transport, forced fattening, and de-feathering collectively generate high-exposure environments where viral and bacterial agents can replicate and spread efficiently. These conditions align with documented contamination levels observed on foie gras farms and in surrounding areas.

Artificially enlarged livers, compromised respiratory function, and prolonged asymptomatic viral shedding in ducks facilitate both persistence and mutation of Highly Pathogenic Avian Influenza (HPAI). The geographic clustering of HPAI outbreaks in regions with concentrated foie gras production further supports the conclusion that these facilities function as source points for avian influenza variants. Cross-species transmission documented in mammals, combined with newly emerging subtypes, substantiates the elevated zoonotic risk presented by these operations.

B. Human Health Consequences of Consuming Inflamed and Contaminated Livers

The hypothesis that consumption of inflamed livers results in adverse human health effects is strongly observed. Multiple hazard pathways were identified.

1) Amyloid exposure

Foie gras contains high concentrations of amyloid fibrils that can withstand typical cooking temperatures. Prior studies indicate that ingestion of amyloid-rich tissues may accelerate amyloidosis in susceptible individuals and elicit inflammatory responses. Populations with Alzheimer's disease, asthma, rheumatoid arthritis, and other inflammatory conditions face elevated risk of exacerbated symptoms due to amyloid exposure.

2) Listeria monocytogenes contamination

Foie gras operations expose birds to continuous fecal contamination, repeated physical stress, and compromised liver function. These conditions support proliferation of Listeria monocytogenes, which can survive chilling and refrigeration. Because foie gras is frequently served raw, lightly cooked, or chilled or seared, consumers face heightened risk of listeriosis. Vulnerable populations are recorded experiencing severe and fatal outcomes.

3) Campylobacter infection

Elevated campylobacter contamination rates in foie gras ducks, including detection in finished fattened products, were shown to carry additional risk. Campylobacteriosis can cause gastrointestinal illness, miscarriage, dehydration, reactive arthritis, and Guillain-Barré syndrome.

4) Flame retardant accumulation

Foie gras exhibits some of the highest measured concentrations of brominated phenols among sampled food items, indicating bioaccumulation of endocrine-disrupting and carcinogenic chemicals. These compounds are associated with thyroid dysfunction, neurological impairment, and increased cancer risk, presenting long-term health concerns for consumers.

C. Ecological Impact and Biodiversity Loss

The findings also confirm that foie gras production contributes significantly to environmental degradation.

1) Avian influenza spread in wildlife

Foie gras farms have been linked to recurrent HPAI outbreaks across multiple countries. The use of infected duck manure as fertilizer extends exposure pathways to wild species, including raptors such as owls and eagles. Documented mortality in wild birds and mammals highlights the expanding ecological footprint of these outbreaks.

2) Water pollution and harmful algal blooms

Foie gras operations produce nutrient-dense wastewater containing nitrogen, phosphorus, and fecal pathogens. Runoff from these sites contributes to eutrophication and Harmful Algal Blooms (HABs), which reduce dissolved oxygen and cause large-scale marine die-offs. HAB events have been linked to nutrient overload and compromised municipal drinking water systems.

D. Effects on Animal Quality of Life

The hypothesis that the personal experience and welfare of birds are significantly compromised is fully supported. Forced feeding causes severe physiological alterations consisting of: hepatic lipidosis, respiratory capacity reduction, esophageal injury, heat stress, and organ failure, as well as behavioral signs of aversion, fear, and distress. Mortality rates in force-fed birds are 10–20 times higher than in non-force-fed birds, demonstrating the severity of the procedure. The data confirm that foie gras production requires bodily stress incompatible with normal function.

E. Synthesis of Findings

Collectively, the results indicate that fattened waterfowl production presents intertwined public health, environmental, and ethical hazards. The convergence of zoonotic risk, foodborne pathogens, toxic chemical accumulation, ecological degradation, and animal suffering establishes foie gras as a high-risk product with consequences extending far beyond the farm environment. The findings support the need for regulatory reassessment and the development of mitigation strategies to reduce exposure, environmental harm, and animal welfare violations.

IV. Conclusion

In light of the recent emergence of a mammal-mammal and animal-human transmissible variation of HPAI, a global examination of high-risk production, such as the fattening of waterfowl for foie gras or any reason beyond medicinally for health, is recommended. Recognizing that concentrated foie gras zones are hot spots for HPAI outbreaks internationally, a cease-and-desist transition is recommended to eliminate transmission epicenters. Undercooked foie gras should be avoided in order to avoid potential exposure to HPAI, Listeria, Campylobacter, and BrPhs. Consumption should be avoided to reduce exposure to amyloids and long-term development of degenerative diseases. Alternatives to force-fed waterfowl products should be further reviewed.

Conflict of Interest

AF and AC are contractors for Animal Rights Initiative, a nonprofit organization that operates under the DBA Animal Research Initiative to conduct scientific research. Neither author received specific funding or grants for the development of this paper, and no dedicated funding was allocated for the investigation. The research aligns with the organization's broader priorities and may inform future initiatives. The authors declare no financial interests or commercial relationships that could be construed as potential conflicts of interest or influence on this paper.

Author Contributions

AF and AC conducted the research; AF and AC analyzed the data; AF wrote the paper; all authors approved the final version.

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