

INTERNATIONAL JOURNAL OF LAW
MANAGEMENT & HUMANITIES

[ISSN 2581-5369]

Volume 5 | Issue 5

2022

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Natural Vitamin D vs. Supplemental Vitamin D: Proposing a Federal Statute to Require Natural Sunlight Exposure for Vitamin D Absorption for Factory Farm Animals that are used for Food Production

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ABSTRACT

No sunlight, no natural vitamin D, and no strong immune system; that is the crux of an argument against factory farms housing tightly packed caged animals with almost no exposure to sunlight. Legal and medical analyses are presented to justify the necessity of proposing federal legislation requiring natural sunlight for farm animals raised for food production. Factory farming gained popularity in the the1920s and was one of the primary industries producing foodborneillnessesis poultry. Natural vitamin D from sunlight has many promising properties against poultry-based foodborne pathogens, parasites, diseases, and bacteria(Salmonella, Escherichia Coli, and Campylobacter) that grow in the intestine and can be passed on to human consumers. Being a fat-soluble vitamin, vitamin D can be obtained by supplementing farm animals' feed or by absorption of sunlight through the skin. Sunlight is the best source of natural vitamin D which boosts animals' immune system and overall health, as compared to vitamin D supplements. Though factories farms proclaim to maximize food production in an economically feasible way, the true cost is evident in the increased health care cost, water pollution, and environmental waste. Given the numerous health benefits of sunlight exposure, it is clear that factory farms should be legally required to operate by using humane methods of farming. Therefore, Congress should recommend to the United States Department of Agriculture provisions enforced by a federal statute to mandate factory farms to provide sunlight access to farm animals to protect human consumers from foodborne illnesses.

Keywords: *factory farm animals; vitamin D; proposed federal law; Salmonella, Escherichia Coli; Campylobacter.*

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I. INTRODUCTION

Natural sunlight exposure may improve factory farm animals' immune systems to fight against viruses, bacteria, parasites, and pathogens that are transmittable to humans who consume the animals. The United States has among the weakest farm-animal-welfare standards in the developed world.²⁸ There are no federal statutes requiring sunlight exposure for factory farm animals to obtain natural vitamins D. There are approximately nine billion factory farm animals raised for food production in the United States each year—one million slaughtered per minute.²⁸ Factory farms are a major source of food supply for human consumption. Factory farming is an industrialized practice of breeding and raising thousands of animals to produce meat, eggs, or milk in the fastest, most efficient, and cheapest way possible for human consumption.^{3,11,25} The percent of farm animals living on factory farms is broiler chickens (99.9%) turkeys (99.8%), egg chickens (98.2%), pigs (98.3%), and cows (70.4%).⁵⁴

Factory farming is an intensive agricultural strategy to maximize food production at the least expense. Factory farms consist of livestock and/or poultry such as chickens, pigs, cows, and other animals for food production or products for human production or other animals. Unlike small family farms where animals can walk around and have ample living space, factory farm animals are confined in poorly sanitized and dense pens and cages. Factory farm animals are prevented from walking outside or moving around within their pens and cages which restricts sunlight exposure. Sunlight can help prevent the transmission of parasites and bacteria to humans.²³ According to a study done by the National Institutes of Health, vitamin D can help reduce the risk of developing various types of cancer. Natural vitamin D from sunlight exposure is essential for humans and animals to boost immune systems. Vitamin D is also essential for the absorption of calcium, which is necessary for strong bones.¹⁰

Among factory farm animals, chickens are the most abused animals because they are exempt from legal protection.³⁰ For instance, five to ten chickens are cramped inside of a cage that only allows space that is less than a sheet of letter-sized paper, unlike other animals whereby adequate space is granted.²² Chickens have limited space which decreases their mobility and deprives them of free movement. Chickens are subjected to mutilation of their beaks with hot blades, confinement, and deprivation of the ability to live their lives as active beings.³⁰ Because factory farms allow chickens to be bred and raised at such high rates, many chickens risk exposure to transmittable parasites and bacteria which threatens both the chickens and humans. Poultry is exempt from the Humane Method of Slaughter Act, a federal law that requires some animals to be rendered insensible to pain before slaughter.¹⁹ Human attitudes toward animals

indicate that generic disapproval of their suffering gratuitously at human hands is a social norm.¹ Chickens are not rendered unconscious before slaughter. Chickens are subjected to disastrous pain including electrified water baths that stun chickens during the slaughter process.^{12,18,19} Not only are chickens subjected to intense pain before becoming unconscious, but chickens also raised on factory farms are typically deprived of sunlight which has serious health implications that may be transmittable during the slaughter process. There is no secret that chickens need vitamin D to help boost their immune systems before being slaughtered. Chickens need sunlight for strong bones and proper immune system function. Vitamin D is also essential for the absorption of calcium, which is necessary for strong bones.^{9,10,38,41} Deprivation of sunlight limits not only vitamin D absorption, but also calcium in animals which could result in unhealthy outcomes for human consumption.

II. BACKGROUND

Factory farming became increasingly popular in the 1920s when it was discovered that thousands of animals could be housed cost-effectively and cheaply for the farming industry.³⁵ Less stringent and easier approaches to maximum food production appeared to be primary instead of the benefits of sunlight exposure. The factory farm industry discovered that vitamins A and D could be artificially added to animals' feeds. Little to no emphasis was placed on the benefits of sunlight exposure a natural source to boost animals' immune systems to prevent the risk of foodborne illness. It is no surprise that foodborne illnesses are major public health concerns for human consumers. An absence of a federal law requiring sunlight exposure to grant natural vitamin D for factory farm animals may consequentially allow an increase in the risk of foodborne illness transmittable to humans. Therefore, there is a need for Congress to enact a federal statute that requires sunlight exposure to factory farm animals to boost the animals' immune systems to prevent transmittable pathogens to humans.

The factory farming industry focuses more on using faster processing methods by overcrowding animals in dark confined pens and cages instead of considering how the pens and cages serve as hubs for pathogens.³⁵ The factory farm industry must consider the benefit of natural sunlight for animals' immune systems to eliminate foodborne illnesses in humans. One may question why factory farms are not allowing factory farm animals, in particular chickens, to have exposure to sunlight. Chicken coops can be expensive to build and maintain. When considering the long-term benefits of healthier chickens and human consumers, it is worth the investment. Therefore, a federal statute is necessary to require natural sunlight access for factory farm animals to charge up the animal's immune system which ultimately helps to safeguard the health

of humans.

III. THE SHIFT FROM SMALL FAMILY FARMS TO FACTORY FARMS WITH LACK OF HUMANE TREATMENT

Before the 1920s, animals raised for food production were bred and raised on small family farms. Farmers provided care to their farm animals. Animals were allowed to roam grassy pastures to stretch their legs and/or wings and enjoy sunlight to naturally develop vitamin D to boost their immune systems.^{3,12,18,29,30,35} Animals had adequate living space to move around without the fear of scraping against confined wired cages. Outdoor pastures and sunlight fulfilled animals' needs and provided benefits for the small farmers by ensuring a natural supply of vitamin D from sunlight access to the animals and potentially better control of diseases.

The transition from small family farms to industrial factory farms deprived animals of natural sunlight, created a stressful and inhumane environment, and created a rise in antibiotic use. Factory farm animals needed an increase in antibiotics to keep them alive because of their new deplorable conditions of living in dark, unclean, unsafe, and disease-infected pens and cages.^{12,17,30,35} The rise in the use of antibiotics created an increase in antibiotic-resistant microbes that poses threat to the health of animals as well as humans.^{13,17,30,42}

IV. THE SHIFT FROM SMALL FAMILY FARMS TO FACTORY FARMS WITH NO ACCESS TO NATURAL SUNLIGHT

The agricultural industry has overlooked the historical benefit of natural sunlight that small family farmers relied on and used as a cost-effective and safe measure to boost animals' immune systems instead of overuse of antibiotics. Consumers are unaware that some factory farm animals are deprived of natural sunlight which is necessary to fight diseases and prevent transmission to humans who consume them. Natural vitamin D helps to prevent the spread of diseases in animals and humans by boosting animals' and humans' immune systems to automatically fight against diseases.^{22,29,31,38} Therefore, federal law is necessary to require daily sunlight exposure to animals to help prevent the risk of foodborne illness.

After the 1920s, giant food conglomerates quickly pushed small family farms out of the way because of the new industrialized way to increase animal production cost-effectively.³⁰ These giant food conglomerates were the factory farms that monopolized the industry to maximize profits with fewer expenses. Factory farms became an industrial system that increased revenue for factory farm owners who produced milk, meat, and eggs. The days of having a quality of life slowly vanished, and animals no longer enjoyed a flexible and stress-free environment to

move around. Access to sunlight, sanitized conditions, and safe living spaces was limited, if not completely absent.

V. CONGRESS SHOULD ADDRESS THE EXPANSION OF THE FACTORY FARM INDUSTRY TO REGULATE OPERATIONS AND PROTECT HUMAN CONSUMERS

Congress should enforce federal law, instead of local or state law, because factory farming exists in several states throughout the United States. In 2013, the leading states with factory farms were Iowa, Minnesota, North Carolina, Texas, and California with a total of 6,458 as illustrated in Table 1.⁸In 2020, there were roughly 1.6 billion factory farm animals housed in 25,000 factory farms that spread across the United States.^{17,18}In 2022, Iowa increased to approximately 10,000 factory farms¹⁴ and North Carolina increased to 5,700 factory farms³² which is a significant increase since 2013.

Table 1

Leading the Factory Farm States in 2013

State	Number of factory farms
Iowa	1,752
Minnesota	1,289
North Carolina	1,222
Texas	1,067
California	1,028

Many factory farms, in different states, operate with similar agricultural practices by confining animals in condensed, dark, and unclean cages and pens. Several animals' immune systems are weakened from the constant poor living conditions that inhibit their immune systems and make them more prone to diseases.^{30,34,35} The United States Food and Drug Administration continues to search for methods to improve factory farm animals' immune systems to fight against diseases. Though efforts are made to explore the best solution at a cost-effective rate, many issues continue to exist. Some of the United States Food and Drug Administration's efforts are unsuccessful due to ongoing antibiotic resistance.^{7,15,40,45} The absence of sunlight may continue to increase the risk of diseases and create more opportunities for disease transmission to humans. Therefore, federal law should mandate access to sunlight for factory farm animals to improve the animals' immune systems to guard against transmitting foodborne illnesses.

VI. ARGUMENTS

There is an urgent need for Congress to require the United States Secretary of Agriculture to enforce measures to improve factory farm animals' immune systems to prevent transmittal foodborne illnesses. Compelling arguments can be made to Congress that factory farms should be regulated because animals are forced to live in inhumane conditions and endure unnecessary suffering. Strong arguments can be made to Congress that there are harmful effects of antibiotic resistance on animals' immune systems that are fatal to humans. The cost-effectiveness of sunlight exposure for factory farm animals provides a free and healthier natural source of vitamin D to boost the animals' immune systems in comparison to the increased cost and risks of antibiotics. Thereby, a significant argument is made that there is an absence of a federal statute to protect farm animals that permits unregulated practices, conditions, and treatment for factory farms that cause harmful conditions and death for humans.

(A) Congressional Regulation is Necessary Because of Disease Resistant Strains of Antibiotics in Farm Animals that are Used for Food Production

Factory farms are at risk of being breeding grounds for disease-resistant strains of antibiotics because of unclean living conditions and administered overuse of antibiotics.^{7,30,45,46} Some factory farm animals are resistant to some antibiotics. Natural vitamin D from sunlight exposure has promising results for boosting animals' immune systems. Without adequate sunlight exposure to animals to improve their abilities to defend against parasites and bacteria, the risk of resistance to antibiotics creates major concerns for humans who consume animals with weakened immune systems. Over one-half of antibiotics produced in the United States is required and used in food animal production.²⁰ There were 28.8 million pounds of antibiotics sold and distributed for use in food animals in 2009.^{26,39,45} Some animals are injected with increased use of antibiotics, and oftentimes, several animals' immune systems are not receptive toward antibiotics to guard against diseases.⁷ Such alarming facts raise concerns for the health risk factors for human consumers.

Several factory farm animals have developed a resistance to antibiotics because unsanitary and unhealthy conditions in factory farms have weakened the animals' immune systems. A federal statute that requires the factory farming industry to grant sunlight exposure to factory farm animals may potentially aid in improving these animals' immune systems, eliminate antibiotic resistance, and increase healthier food production. Animals develop resistance to antibiotics when their bodies adapt to conditions that result in the ineffectiveness of some antibiotics to kill virus pathogens or diseases.^{7,26,33,45} These animals are confined in dark warehouses that deprives

them of natural sunlight to guard their immune systems against virus, pathogens, and diseases. There is no doubt that animals and humans need sufficient sunlight to boost their immune systems to protect against viruses, diseases, and pathogens.^{8,21,49}

1. Congress Should Regulate Factory Farming Because of Antibiotic Resistance in Animals that are Used for Food Production

A strong argument can be made to Congress that there are harmful effects of antibiotic resistance in animals' immune systems that may be detrimental to humans. Approximately two-thirds of the 1,400 pathogens that are spread from animals to humans may have originated from factory farm animals.^{17,18,30,32,35} Many consumers are unaware that pathogens, viruses, and diseases can reproduce in as little as twenty minutes in animals.¹⁵ Such rapid reproduction of pathogens, viruses, and diseases in animals is alarming. Thus, routine administration of antibiotics can induce the faster development of antibiotic-resistant bacteria.¹⁵ Antibiotic resistance among animals should be considered an epidemic in the United States due to the potential for increased foodborne illnesses. The factory farm industries may have significantly contributed to the antibiotic resistance that has emerged on farms because the farms are ideal breeding grounds for diseases. When antibiotic-resistant bacteria develop in animals, the said bacteria can affect humans.^{30,34,36,40,43} There should be a public health plea for the welfare of humans since antibiotic resistance in animals presents a clear and present danger to the health of humans.

Congress should enact a federal law enforcing provisions for farm animals to have access to daily sunlight exposure to improve the animals' immune systems. There is no doubt that antibiotic resistance in animals poses a serious threat to humans. Since antibiotic resistance in animals can contribute to fatal effects in humans, Congress should strive to implement corrective actions to safeguard the health of humans. Therefore, there is an urgent need for effective measures, other than the overuse of antibiotics, to be implemented to power up animals' immune systems to fight against foodborne illnesses.

2. Congressional Legislation Has Failed to Properly Address the Overuse of Antibiotic Usage in Factory Farm Animals that Causes Harmful Conditions and Deaths in Humans

The current overuse of antibiotics used in animals is fueling the rise of antibiotic-resistant bacteria in factory farm animals.^{12,17,18,30,43} Though the United States has implemented strategies, additional measures are needed specifically for factory farm animals because antibiotic resistance contributes to foodborne illnesses that have killed people.^{13,33,36,37} Measures to curtail foodborne illnesses have been attempted but many have been unsuccessful.

For instance, in March 2009, legislation proposed the H.R.1549: the Preservation of Antibiotics for Medical Treatment Act to prohibit types of antibiotics from being used in animal feed.^{45,46,47,50} In *NRDC v. EPA*, the court reversed a district court's decision to require the Food and Drug Administration to hold hearings on the withdrawal of approval for penicillin and tetracycline in animals' feed, but the issue has created public health concerns.⁵⁰ Despite these efforts, there continues to be a need for Congress to enact a federal law mandating measures to improve animals' immune systems such as sunlight exposure instead of the overuse of antibiotics.

3. Congressional Legislation is Required to Address the Ineffectiveness of Antibiotics alone in Factory Farm Animals that are Used for Food Production

In the United States, the majority of antibiotics used are administered to animals to fight against pathogens while a smaller portion is administered to humans. Even though factory farm animals are administered antibiotics, there is a chance that several animals still enter slaughterhouses with harmful pathogens. The current usage of antibiotics alone is no longer effective for factory farm animals.^{7,13,33,36,37} Nothing lasts forever and this certainly applies to antibiotics. The United States Food and Drug Administration has failed to introduce an antibiotic that has a permanent effective rate.^{15,30,33,41,48} In the 1940s, penicillin was one of the first drugs to prove widely effective against 91% of some untreatable bacterial infections in animals and humans.¹⁵ By 1955, penicillin's efficacy against some bacterial infections was short-lived. Penicillin's efficacy declined and was only effective for 10% of new cases.¹⁵ Granting access to sunlight exposure to acquiring vitamin D may help improve animals' immune systems to reduce antibiotic resistance. Since factory farm animals lack access to direct sunlight exposure, the risk of antibiotic resistance may continue to increase.

Antibiotics given to animals are not fully effective because of the animals' weakened immune systems. Impaired immune systems are likely to contribute to health risk factors for human consumers. No federal law exists that requires the factory farm industry to provide a warning or an explanation about the use of effective or ineffective antibiotics.⁴⁸ Widespread arguments have been made for greater regulation of antibiotic use and alternative measures for factory farm animals. Table 2 below illustrates how many factory farm animals have developed antibiotic resistance to pathogens such as for *E. Coli* in cows,³⁹ *Campylobacter* in chickens,⁴⁰ and *Salmonella* in chickens.⁵

Table 2**Factory Farm Animals with Antibiotic Resistances to Pathogens**

Factory Farm Animal	Pathogen	Number/percentage of animals	Antibiotic-resistant %
Cows	E. Coli	One out of every four Cows	90
Chickens	Campylobacter	40% out of 200	75
Chickens	Salmonella	7,033	80.3

Antibiotics alone are ineffective for factory farm animals since several animals continue to carry pathogens even after they have been administered antibiotics.^{4,5,39,40} Since factory farm animals have developed a resistance to several antibiotics, Congress should be convinced that an alternative or combination approach is needed to prevent health and safety factors for humans. Natural sunlight, with or without minimum antibiotics, may prove to be an effective measure to boost the animals' immune systems. Therefore, there is a need for a federal law to permit daily sunlight exposure to animals to eliminate or reduce the spread of foodborne illnesses to humans.

(B) Congress Should Explore Public Health Concerns to Address Foodborne Illnesses in Farm Animals that are Transmittable to Humans

Public health experts have asserted that a wealth of evidence links factory farm animals with foodborne illnesses. Attention should be drawn to the fact that public health experts have declared that foodborne illnesses in humans are also caused by the overuse of antibiotics in factory farm animals.^{4,30,50,54} Effective measures are needed to improve factory farm animals' immune systems because antibiotic resistance is affecting millions of people and killing people in the United States.^{13,33,36,37} In particular, 1,25(OH)2D3 has been demonstrated to enhance pathogen-specific immune responses, including phagocytosis, differentiation, and antimicrobial peptide production in macrophages,⁹ antimycobacterial responses for human tuberculosis,²⁷ productions of cathelicidin, an antimicrobial peptide for *Mycobacterium tuberculosis* infections in human monocytic cells,⁸ and significant increase of humoral immunity against the foodborne fowl typhoid.⁸ Not just from vitamin D deficiency, but also immunological stress, laying hens may benefit from vitamin D treatment.^{52,53} A strong systemic antimicrobial action is also aided by the activation of B and T cells as well as by increasing the activity of monocytes and

macrophages.⁵³ Vitamin D levels in the blood directly affect macrophages, increasing their capacity and resulting in the maturation and synthesis of cytokines, acid phosphatase, and hydrogen peroxide.^{4,5}

Congress has the power to regulate the agricultural industry and enact federal laws. Congress should seriously consider that factory farms pose a threat to humans due to the risks of transmittable foodborne illnesses. Factory farming tends to accelerate the development of antibiotic resistance by failing to identify and implement measures to improve the animals' immune systems.^{17,18,30,51} There are common foodborne illnesses that are linked to factory farm animals such as Campylobacter in chickens,³³ Salmonella in cows,¹³ Salmonella in chickens,³⁷ and E. Coli in cows.³⁶

Table 3

Common Foodborne Illnesses Linked to Factory Farm Animals

Factory farm animal	Foodborne illness (Pathogens)	Number of estimated humans affected by the pathogen/disease (cases each year)	Number of estimated human deaths (per year)
Chickens	Campylobacter	2.4 million	50
Cows	Salmonella	1.4 million	600
Chickens	Salmonella	40,000	2000
Cows	E.coli	73,000	61

Factory farm animals' weakened immune systems should be a major concern for Congress because of the estimated number of humans who are affected and killed by foodborne illnesses as illustrated in Table 3. Animals' weakened immune systems create a passage for the spread of foodborne illnesses to humans. Foodborne illnesses place burdens on everyone due to the rising cost of health care to treat illnesses.^{17,18,30,51} Congress should consider measures to improve the overall health conditions of animals which contributes to better health outcomes for human consumers. Federal law is needed specifically focusing on improving factory farm animals' immune systems to prevent the spread of pathogens to humans.

(C) Congress Should Explore the Causes of Food Recalls from Factory Farms Because Food Pathogens Poses Risks for Human Consumptions

Food recalls are an inevitable result of the factory farm system because of the risk of foodborne illness.^{3,12,17,18,30} Factory farm animals spend their short lives living in closed areas that deprive them of natural sunlight which may contribute to their weakened immune systems. Public health concerns should be asserted due to overcrowded animalshave2 weakened immune systems and being more susceptible to infection and diseases that could cause foodborne illnesses in humans. Overcrowding animals pose many risk factors to humans due to the risk of unhealthy animal products. Though the United States Food and Drug Administration is charged with protecting consumers against impure, unsafe, and fraudulently labeled products,^{45,46,47} factory farms continue to be breeding sites for diseases and disease-resistance strains of antibiotics.

Food Net recorded 25,866 instances of infection in 2019, a rise from 2016 to 2018 and 2019 in the number of foodborne disease cases in the United States.⁴³ The United States Food and Drug Administration reported that 28.8 million pounds of antibiotics were sold and distributed for use in food animals.^{45,46,47} Such public health concern is alarming because of the increased need for antibiotics to keep factory farm animals alive and prevent disease transmission to humans. The increase in antibiotics may endanger human consumers.

For the last forty years, farmers have fed animals feed laced with antibiotic drugs.³⁰ Resistance to antibiotics creates treatment failure for most parasites and pathogens and leads to an increased number of infections in animals that are transmittable to humans.^{13,23,30,36,42} Without a doubt, the risk of animals' resistance to antibiotics is ineffective to ensure the quality of life for human consumers. There is also an elevated risk of antibiotic resistance and infection of other animals with several parasites and pathogens that can affect humans such as Salmonella and Escherichia Coli(E.Coli) 0157:H7 in cows,^{20,39} mad cow disease in cows,^{18,20,39} Salmonella in chicken,^{4,5,13,23} and Swine flu in pigs.^{14,26,32} Therefore, there is an urgent need to improve the lives of factory farm animals through better agricultural practices. Increased sunlight exposure instead of overuse of antibiotics may promote healthier animal immune systems that result in better food production.

The Food Safety Modernization Act is the most sweeping reform of food safety laws after more than seventy years, which was signed into law by the former president, Barack Obama, on January 4, 2011.⁴⁶ The aim of the Food Safety Modernization Act is to ensure the U.S. food supply is safe by shifting the focus from responding to contamination to preventing it.⁴⁶ The Food Safety Modernization, like the United States Food and Drug Administration, continues to

search for new methods to ensure preventive control of food safety strategies. The United States Department of Agriculture explores research and educational activities to address new challenges. Opportunities are sought to stay abreast of rapidly advancing technologies, evolving consumer demand, and the need to make positive contributions to environmental, human, and animal health.^{45,46,47} Therefore, the United States Department of Agriculture should consider alternative methods such as sunlight exposure as an avenue to help boost the animals' immune systems to create healthier food production.

(D) Congress Should Regulate Factory Farming Because Absence of Sunlight Exposure for Farm Animals Contributes to Foodborne Illnesses and Deaths in Humans

A compelling argument exists that sunlight exposure for factory farm animals provides a free and healthier natural source of vitamin D for animals and humans. Factory farm animals and humans benefit from sunlight exposure because the sun naturally manufactures vitamin D in animals' and humans' bodies to boost their immune systems.⁴¹ According to the United States Department of Health and Human Services, vitamin D is essential for the formation, growth, and repair of bones, for normal calcium absorption, and for immune function.³¹ Congress should consider that frequent exposure to sunlight has proven to be beneficial to immune systems. Sunlight has been effective to promote sufficient vitamin D synthesis without the need for supplements or artificial sources of vitamin D.^{21,49} Vitamin D can serve as a low-cost form of prevention and may even be therapeutic if used alone or in combination with other antimicrobial drugs. Therefore, it should be made illegal for factory farms to prevent farm animals from getting enough vitamin D (natural sunlight) to build up their immune systems and keep humans who eat the animals from contracting parasites and bacteria.

Research shows that 80% to 100% of the natural vitamin D that animals and humans need comes from the sun.²¹ Factory farm animals and humans could benefit from the sun's direct effects on their bodies because sunlight produces a safer source of vitamin D in animals and humans. In humans, lack of direct sunlight exposure may cause vitamin D deficiency. Vitamin D deficiency puts humans at an increased risk for a host of health ailments such as obesity, weakened immune systems, foodborne illnesses, diabetes, premature deaths, hypertension, fibromyalgia, and chronic muscle pains.^{5,22,25,27,29,41} Since vitamin D deficiency results in several health ailments in humans, Congress should be driven to enact a federal law to prevent harmful effects of vitamin D deficiency in animals that may be fatal for humans.

In the United States, there is an economic burden of \$40 to \$53 billion dollars per year because of vitamin D deficiency in humans.²¹ Too much direct sunlight exposure has been known to

cause skin cancer in humans.⁴⁹ In contrast, a lack of direct sunlight increases humans' chances of cancer by 70% because humans' bodies need natural sunlight to synthesize vitamin D to support their immune systems.²¹ The benefits of sunlight exposure for vitamin D absorption outweigh many factors when safety measures are in place to prevent cancer. Thus, humans only need ten to fifteen minutes of direct sunshine three times a week to produce the body's requirement of vitamin D to promote healthy immune systems.²¹ Since sunlight exposure is needed to boost humans' immune systems; consideration is needed to grant animals daily access to natural sunlight.

1. Congress Should Require Natural Sunlight Exposure for Factory Farm Animals

A substantial argument can be made that the lack of direct sunlight exposure for factory farm animals creates serious health and safety issues in humans. The absence of natural sunlight for animals facilitates the spread of viruses, pathogens, and diseases that are transmittable to humans.^{17,30,42,43} Natural sunlight is a free source of vitamin D for factory farm animals to charge up their immune systems. An opposing argument can be made that the factory farming industry has already implemented a measure to provide some animals, such as chickens, with artificial lighting. The purpose of artificial lighting is to manipulate chickens to eat as often as possible, not as a measure to improve chickens' immune systems.^{18,34} Thus, other factory farm animals, such as cows, pigs, etc., are not provided with artificial lighting. Direct sunlight exposure instead of artificial lighting provides animals with sufficient vitamin D to improve their immune systems to help prevent the spread of foodborne illnesses.

For several years, the factory farm industry has administered large amounts of antibiotics to farm animals as a measure to boost the animals' immune systems to fight against harmful pathogens.³⁴ Factory farm animals have developed a resistance to several antibiotics, which places the great risk on humans. Though the factory farm industry has cheaply manufactured food production for maximized food consumption for humans, the true cost has been diverted to other areas. An increased health care cost associated with antibiotic-resistant bacteria exceeds four billion dollars each year in the United States.¹⁵ The true cost of operating a factory farm is diverted to increased health care costs, water pollution, global warming pollution, diminished biodiversity, declined consumer health, poor animal welfare, and environmental waste that factory farm animals create.^{17,18} Sunlight exposure can improve animals' immune systems to decrease the expenses of medical care to treat foodborne illnesses; reduce the spread of pathogens from animals to humans, and reduce the rate of human deaths associated with foodborne illnesses.^{4,18,23,28,30}

2. Congress Should Require Outdoor Access or a Refractory Roof for Sunlight Exposure to Factory Farm Animals

There are requirements that can be imposed upon the factory farm industry to mandate sunlight exposure for factory farm animals. Congress should enact a federal law requiring access outdoors at scheduled intervals or installation of a retractable roof on warehouses, facilities, etc., that houses the farm animals. Since the United States Secretary of Agriculture is responsible for the safety of food production, Congress can direct measures requiring inspections and compliance with laws. Granting outdoor access to the animals poses minimal cost while ensuring free vitamin D from the sunlight to improve their immune systems. Allowing animals to have daily access to walk outside permits the animals to strengthen their legs which improves circulation that may result in better food production. An opposing argument could be made that requiring daily outdoor access for the animals may generate an expense of paying employees to work additional hours to move the animals in and out of the warehouse or barn. The potential decrease in health care costs and deaths among humans outweigh the additional labor expenses that the factory farming industry may encounter.^{18,4,30,48}

An alternative argument could be made that the factory farming industry should be required to install retractable roofs on housed facilities instead of allowing animals to physically access the outdoors. Additional labor hours for factory farmers may be eliminated since retractable roofs would prevent the necessity of farmers moving thousands of animals inside and outside housed facilities. A retractable roof allows the interior of a facility to be open to the outdoors. The price of a retractable roof may vary depending upon the square footage of a facility. Factory farmers may argue that a retractable roof would create an additional expense for the industry. Since the factory farming industry is known for maximizing profit cost-effectively and cheaply, Congress should require factory farmers to allocate some of the profit toward a retractable roof.

3. Congress Should Explore the Benefits of Natural Vitamin D from Sunlight Exposure to Factory Farm Animals

There is a need to explore the benefits of how natural vitamin D from sunlight exposure can improve factory farm animals' immune systems to fight against viruses, bacteria, and pathogens that are transmittable to humans. Vitamin D is more in chickens' egg yolks that are exposed to sunlight than chickens' egg yolks that are fed with vitamin D supplements.⁵² Lack of natural sunlight and fresh air permits some diseases to spread like wildfire because of animals' weakened immune systems and disease susceptibility.^{27,43} There are no laws mandating access to sunlight for natural vitamin D absorption to improve animals' immune systems. Therefore,

Congress should mandate laws that require the U.S. Department of Agriculture to inspect factory farms to ensure daily sunlight exposure to animals to enhance their immune system, which may reduce the transmission of foodborne illnesses to humans.

(E) Congress Should Regulate the Agricultural Practices of Factory Farms to Ensure Humane Farming Methods

Factory farming is a method of breeding and raising farm animals characterized by permitted agricultural practices of overcrowding, restricted movement, unnatural diets, and surgical procedures with no anesthesia.^{2,12,17,18} Since the 1920s, factory farms have primarily replaced family farms in the United States.³⁴ Factory farms confine cows, pigs, turkeys, chickens, and other farm animals in high-density housing units that deprive animals of natural sunlight and the luxury of grass beneath their feet.^{12,18,34} Not only are the farm animals deprived of sunlight, but daily fresh air is absent. Hence, pigs and chickens are compressed into small spaces that prevent them from seeing outdoors, and beef cattle and dairy cows are crammed onto feedlots with no access to pastures.^{14,16,20,30}

Factory farms became increasingly popular because of proclaimed cost-effective practices. Housing animals inside dark metal pens, crates, and cages to maximize space became an acceptable practice.^{19,34,56} Lack of natural sunlight, compounded with unclean and dense living areas, may allow pathogens to rapidly spread among farm animals, creating a host of public health concerns due to food safety problems. Since the 1920s, it has been no secret that the majority of factory farm animals live in confined living conditions that causes abnormal, aggressive behaviors and cannibalism caused by the stressful environment.^{2,19,30,34} Chickens suffer severe feather loss, bruises, and abrasions from constantly scrapping against wire cages because of their limited living spaces.^{12,17,18,35} Because some of these animals live in unhealthy conditions, painful routine injections of antibiotics are administered to try to prevent transmittable foodborne illnesses to humans.^{18,48,50} There is no legal protection for factory farm animals bred or raised on farms to prevent repeat doses of antibiotics that are harmful.^{2, 11, 15,28} These animals continuously live in stressful and abusive environments. Such conditions appear to be acceptable practices within the factory farming industry.

(F) Congress Should Regulate Factory Farming Because of Emotional and Physical Abuse Inflicted Upon Animals Before Being Slaughtered

Before the evolution of factory farming, poultry and livestock animals had the freedom to enjoy fresh air and natural sunlight to boost their immune systems. As time progressed, factory farm animals were confined inside dark warehouses without access to daily sunlight. These animals

are deprived of humane treatment and encounter endless emotional and physical abuse that are acceptable agricultural practices within the factory farming industries.^{2,12,17,18,35} Despite the intense stress, pain, and lack of care for injured factory farm animals, agricultural practices permit the molting of egg-laying hens, confinement of animals, castration of animals without anesthesia, and forced feeding of animals.^{17,30,34,48} Such inhumane treatment subjects the animals to harsh conditions even before being slaughtered, whereby some agricultural practices have become standardized methods within the factory farming industry. These practices create substantial detrimental effects on the animals overall well-being by enduring stress that ultimately weakens their immune systems and may contribute to the resistance of some antibiotics.^{2,18,30,32} Though there are some positive antibiotic usages, the effectiveness is often only temporary because some animals quickly develop antibiotic resistance.^{2,7,39}

(G) Congress Should Regulate Agricultural Practices of Factory Farms Because of the Unnecessary Stress that Weakens the Animals' Immune Systems

Agricultural practices have permitted the housing of animals in dark and contaminated areas that have served as breeding grounds for diseases that are transmittable among animals and from animals to humans.^{28,30} The farm animals are subjected to a great deal of stress that can weaken their immune systems. Though food production is needed, creating stressful conditions for the animals, denying them access to natural sunlight, and depriving them of a reasonable quality of life undermines human safety. Because of some substandard living conditions for factory farm animals, several diseases have the propensity to pass down to the animals' offspring and surrounding animals due to the proximity of the animals that agricultural practices permit. Some agricultural practices place a strain on the animals' health and cause stress. Stress weakens animals' immune systems, which may cause health and safety risks for humans due to the risk of foodborne illnesses.^{18,30,32,34}

There are no predetermined factors that humans can use to determine if a farm animal is sick before the animal becomes part of their family's meal. Consequently, several people are exposed to foodborne illnesses that could have been eliminated or reduced if the factory farm industry had granted sunlight access to the farm animals. Agricultural housing practices increase the likelihood of foodborne illnesses, whereby stressful conditions weaken the animals' immune systems. When the animals' immune systems are weakened, diseases spread among the animals because of the contagious and deplorable dense living conditions. Overcrowded animals have weakened immune systems that make them susceptible to diseases that are transmittable to humans.^{4,5,8,27,30,44} Though societal unacceptable agricultural practices exist; farm animals have no legal protection that regulates the treatment, care, or conditions within

the factory farm industry.

(H) Congress Should Enact Legal Protection for Factory Farm Animals

There is no secret that the United States of America, like many countries, has limited to no laws or provisions protecting factory farm animals. Factory farm animals have poor living conditions, unsanitary environments, and inhumane conditions and are deprived of access to natural sunlight while being packed in close, confined wired cages, pens, or crates surrounded by waste and parasites.^{12,14,17,18} Congress should enforce a federal statute requiring legal protection for factory farm animals to prevent unnecessary, cruel conditions.

1. Farm Animal Federal Legislation Should be Enacted Because There is an Absence of Laws Protecting Animals on Farms from Inhumane Conditions

Congress should enforce legislation to prevent the unnecessary suffering of factory farm animals. Factory farm animals are excluded from every state's animal anti-cruelty provision.³⁰ No legal protection within a poorly regulated industry equates to diminished standards of care for farm animals, resulting in continuous cycles of sickness from living in inhumane and unsafe conditions. Such poor standards may result in animals being exposed to parasites and bacteria at a faster and more recurrent rate.^{2,6,19} The animals are exposed to diseases and often have no means to boost their immune systems other than the overuse of antibiotics. The use of antibiotics in agriculture is routinely described as a major contributor to the clinical problem of resistant disease in human medicine.⁷

2. Congress Should Legally Require Natural Vitamin D from Sunlight instead of Supplemental Vitamin D for Factory Animals Because of the Risks of pathogens to Human Consumers

Since the evolution of factory farming, factory farmers have resorted to administering animals with artificial sources of vitamin D.^{9,29,30,49} Factory farm animals are bred and raised for food or animal products with limited, if at all any, consideration of how artificial substances can impact their health. Natural sunlight is a power source for animals' immune systems. Sunlight exposure is the only natural and healthy source of vitamin D that quickly powers up animals' and humans' immune systems.^{22,25,29,31} Factory farm animals are deprived of natural sunlight, and sunlight deprivation increases the risk of diseases. Factory farm animals are confined in areas that increase the risk of pathogens like E. Coli, Campylobacter, and Salmonella, which cause foodborne illnesses in humans. E. Coli is a pathogen generally found in cows, Campylobacter is a pathogen normally found in chickens, and Salmonella is a pathogen normally found in cows, chickens, and even vegetables.^{4,13,8,20,23,26,32,39} Sunlight exposure provides natural vitamin D that

allows the immune system too automatically respond not only to these pathogens but also to viruses, diseases, and bacteria. Therefore, Congress should enact a federal law mandating sunlight exposure and improv living conditions for factory farm animals to safeguard the health of animals as well as humans.

3. State Lawmakers Have Not Addressed Legal Protection for Factory Farm Animals

The majority of states in the United States exempt factory farm animals or farming practices from its anti-cruelty provisions, making it impossible to enforce legal action for disastrous treatment. The Animal Welfare Act was signed into law in 1966 and is the only federal law in the United States that regulates the treatment of animals in research, exhibition, transport, and by dealers.⁴⁷ Though the Animal Welfare Act exists, there is a lack of legal protection for basic standards of care and treatment for factory farm animals who are bred and raised for food production. While the Animal Welfare Act excludes factory farm animals while they are on the farm, two federal laws provide some protection to factory farm animals: the Twenty-Eight Hour Law and the Humane Methods of Slaughter Act.

a. Twenty-Eight Hour Law

The Twenty-Eight Hour Law was enacted in 1877, which is a law that provides some protection for transported animals.⁴⁴ The law mandates standards while farm animals are being transported, not while they are on farms. The law requires transported animals, by means other than water or air, to be unloaded every twenty-eight hours for rest, food, and water.⁴⁴ There are exclusions to the law that underlines public health. The law excludes chickens which represent 90% of the animals transported and killed for food production^{44,48}. The law is only for transporting cattle, sheep, swine, and other animals. Even with this law, there is no federal statute requiring sunlight exposure during transportation or on farms that could potentially boost immune systems to prevent transmission of illnesses and fatal diseases in humans.

b. Humane Methods of Slaughter Act

The Humane Methods of Slaughter Act was enacted in 1958. The Humane Methods of Slaughter Act requires that animals are rendered insensible to pain before being slaughtered.^{2,19} The law is vague in clarifying what is insensible pain. Animal protection groups have advocated increased protection and improved slaughter methods for factory farm animals under existing laws.²⁸ The law is also absent about slaughter practices of some religions such as Kosher and Halal.¹⁹ Similar to the Twenty-Eight Hour Law, poultry is excluded from the Humane Methods of Slaughter Act. The law only protects cattle, sheep, swine, goats, horses, mules, and other animals. Though this law provides legal protection for some animals, factory

farm animals continue to be deprived of sunlight that could improve their immune systems to ward off harmful and deadly foodborne illnesses.

VII. PROPOSED FARM ANIMAL FEDERAL LEGISLATION FOR SUNLIGHT EXPOSURE FOR FACTORY FARM ANIMALS

There is a need for a proposed federal statute that requires the factory farm industry to provide daily sunlight exposure to factory farm animals. Though two federal laws already exist, the Twenty-Eight Hours Law and the Humane Methods of Slaughter Act, the laws were not enacted to address methods to improve the animals' immune systems. Since Congress was successful in enacting those two federal laws, Congress has the power to enact a law to safeguard the health of animals that ultimately benefits human consumers. Since factory farms exist in nearly every state, federal law is necessary because of the potential risk of foodborne illness to humans throughout the United States. Congress should direct the United States Secretary of Agriculture to research to explore the effects and benefits of sunlight exposure for animals' immune systems in comparison to the overuse of antibiotics. Congress should aim to enact a new federal law permitting the Secretary of Agriculture to impose fines, violations, and criminal punishment on factory farmers who fail to adhere to the new federal law to prevent jeopardizing the lives of humans.

(A) Proposal for Natural Sunlight Exposure for Factory Farm Animals Act

Congress should enact a federal statute that requires natural sunlight access to factory farm animals that are raised for food production. Congress strives to enact federal laws that are absent of ambiguous terminology. Therefore, Congress should consider the proposed federal law or a modified version, as listed below, for the factory farm industry.

Proposed Statute: **NATURAL SUNLIGHT EXPOSURE FOR FACTORY FARM ANIMALS ACT, 2022**

Preamble: The Act seeks to mandate that factory farm animals are permitted daily sunlight exposure, at minimum, for 1 hour every 24 hours.

Every factory farm owner who breeds or raises poultry or live stock inside of a housing unit must allow daily access to natural sunlight using access outdoors or installation of a retractable roof on the housing unit.

Definition: a) Factory Farm Animals: poultry and livestock, including but not limited to: chickens, hens/roosters, ducks, geese, pigs, turkeys, sheep, goats, and cows.

b) Daily: The provision of this proposed law means factory farm animals must have sunlight exposure every 24 hours for at least one 1 hour per day.

c) Housing Unit: The provision of this proposed law means an area or space that factory farmers use to maintain, store, or confine animals. Housing units are considered as, but are not limited to, a warehouse, barn, shed, factory, cages, pens, or any structure that houses factory farm animals.

Violations: Factory farm owners who do not comply with the provision of the law shall be subjected to fines, violations, and criminal punishment of imprisonment.

(A) Congress Should Enact the Proposed Federal Statutes to Promote Healthier Food Production and the Health and Safety of Human Consumers

Congress should enact this proposed federal statute to improve farm animals' immune systems while eliminating health and safety risk factors for humans. Public health and community organizations should urge Congress to understand that antibiotic resistance in animals presents serious health threats to humans. Natural sunlight exposure could provide a positive and effective method for boosting animals' immune systems against pathogens that are transmittable to humans. By Congress approving the proposed federal law, factory farm owners would be required to provide daily sunlight exposure to factory farm animals to boost the animals' immune systems. In return, the health conditions of animals may improve to eliminate the spread of foodborne illnesses in humans. Since Congress has the power to enact laws and regulate the factory farm industry, Congress should enact a federal law mandating daily sunlight exposure for farm animals used in food production to improve the health and safety of human consumers.

VIII. CONCLUSION

There is a need for a federal statute mandating that the factory farm industry allow animals to have daily access to natural sunlight to obtain vitamin D. Sunlight exposure generates natural vitamin D that is essential to power up factory farm animals' immune systems to help prevent transmittable foodborne illnesses to humans. The factory farm industry has traditionally confined animals in condensed, dark, and unclean pens and cages. Though the factory farming industry has increased production in a cost-effective means, the housing practices of animals have created an increase in parasites, viruses, pathogens, and diseases that often grow and

spread in dark and unsanitary areas, which are harmful and fatal to humans. The overuse of antibiotics is not the solution. Overuse of antibiotics eventually leads to antibiotic-resistant bacteria that often result in transmittable foodborne illnesses to humans. Medications to treat foodborne illnesses contribute to the steadily increasing health care costs each year. Though the factory farm industry focuses on cheaply maximizing food production, the true cost is evident in health care expenses, water pollution, global warming pollution, poor consumer health, and environmental waste that subjects humans to illnesses and fatalities. Federal law is necessary to require the factory farm industry to provide direct sunlight to factory farm animals through means of outdoor access or a refractory roof on facilities. Not only will the federal law mandate standardized compliances within the factory farm industry, but it also will contribute to ensuring a cost-effective and positive remedy for boosting animals' immune systems to help eliminate the spread of foodborne illnesses to humans.

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