

Revisiting Of Food Safety And Standards Act, 2006- An Enigma Of Animal Feed.

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ABSTRACT

Parliament of India has remained oblivious on the issue of inclusion of animal feed in the definition of 'food' in Food Safety and Standards Act, 2006. The cascading effect of this grave omission, on the human health has concerned the legal brains. Attempt has been made in this paper to trace out the origin of the diseases caused by the consumption of feed by animals and subsequent use of such animals based foods by human beings. The requirement of adoption of legal framework viz a viz animal feed by Food Safety and Standards Authority of India (FSSAI) is also discussed. The legal initiatives taken at international/domestic level in order to tackle this issue are also the features of this paper.

Key Words: Food Safety, Animal Feed, Codex Alimentarius, Food Safety and Standards Authority, Bureau of Indian Standards, human health.

I. Introduction

Food safety can be defined as the mechanism of controls that operates to prevent food and food products from the substances that are hazardous to human health. The issue of food safety is a global phenomenon threatening millions of people. Hazard means, "any physical, chemical, or biological agent or condition that may cause an unacceptable risk to human health". A number of food safety related incidents came to the light in the aftermath of achieving gains in food production. The use of pesticides, food additives,

hormones and antibiotics containing chemical agents in excessive quantities with a view to enhance food production remained the primary focus of the countries.¹ The policy of producing vast quantities of food has had an impact on food quality. Presence of alarming level of toxins in the food resulted in the transmission of the toxins to human beings. History has witnessed the communication of infections to humans from the infected animals used as raw material in the manufacturing of food. The safety of food for human consumption cannot be achieved unless and until the raw material used in the production of food is free from contamination. The instances of transmission of infections to humans from animals fed on contaminated feed are not rare. The Food Safety and Standards Act, 2006 (hereinafter called FSA) though enacted in India to ensure safe food for humans has failed to take note of the issue. The FSA has explicitly omitted animal feed from the definition of food. The omission to the extent of exclusion of animal feed in the definition of food gave immunity to the feed manufacturers. They manufacture feed in a manner detrimental to human health, besides lack of regulatory measures gave impunity to them. The avowed objectives and aim of FSA are to provide safe and healthy food to human beings; and same cannot be attained until the animal feed is brought within the ambit of FSA. The unabated consumption of unsafe animal feed has led to the introduction of contaminants and toxins in the food chain, thereby defeating the, hitherto, achieved object of the FSA.

II Implications of Contaminated Feed on Humans

Feed material may contain microbiological and chemical contaminants.²The study of the impact of contaminated feed on humans is nascent, and research on this aspect has started lately. Umpteen times, the attention of the international community was invited towards the issue of transmission of infections to humans from animals infected by consumption of contaminated feed. The occurrence of safety-related incidents in different countries became contributing factors towards the study of the impact of consumption of feed by the animals and their transmission to humans. Earlier the notion remained that there existed no relation between the contaminated feed and transmission of infections to human beings through animals infected by the intake of contaminated feeds. Of late it has been recognized and proved through various studies that animals infected by the consumption unsafe feed can be a potential threat to the health of human beings. Salmonellae, mycotoxins, veterinary drug residues, persistent organic

¹ S.V.R.K. Prabhakar, Daisuke Sano and Nalin Srivastava, *Food Safety in the Asia-Pacific Region: Current status, Policy Perspectives, and a way Forward*, 215-238 (Institute for Global Environmental Strategies, Hayama, Japan).

² Frazzolic, Mantovania, "Toxicants Exposures as Novel Zoonoses: Reflections on Sustainable Development Food Safety and Veterinary Public Health" *57 Zoonoses and Public Health* e136–e142 (2010).

pollutants, agricultural and other chemicals (solvent residues, melamine), heavy metals (mercury, lead, cadmium), and excess mineral salts (hexavalent chromium, arsenic, selenium, flourine), as well as transmissible spongiform encephalopathies; the risk of their transmission to consumers via the food chain cannot be ruled out.³

III Origin of Disease caused by Animal Feed

The first incident regarding the issue of the disease caused by the animal feed was the Bovine Spongiform Encephalopathy (BSE) incident in the United Kingdom in 1996.⁴ BSE is a degenerative brain disease that primarily affects cattle, and may also impact other animals including people. "Bovine" is a sickness that affects cows, "Spongiform" signifies the spongy microscopic appearance of the sick cow's brain and "Encephalopathy" denotes a brain disease. In subsequent years the cattle herd infested with infections in the United Kingdom was on surge. Animals infected by BSE were found to be consuming contaminated feed. The ingredients of contaminated feed mainly contain body parts of those sick animals (cows) suffering from BSE, meaning thereby the disease was transmitted by the use of contaminated feed. The unconsumed part of cow was cooked, dried, and pulverised into powder. This powder was then utilized for a variety of purposes, including an additive in animal feed.⁵ Although, the area was grey, so far as, regarding research, yet the scientists have attributed the cause of the disease to the infected ingredients of animal feed. BSE snowballed into a European epidemic by 1996 and rang alarm bells when the link between BSE and the novel version of human disease Crutzfeldt-Jakob Disease (nvCJD) was discovered.⁶ The use of cattle feed containing rendered down 13SE infected cattle is believed to have aggravated the epidemic. The report of the inquiry in the form of the BSE inquiry report substantiated the spread of BSE in animals as a consequence of the use of infected feed. In order to inquire whether the BSE infection can be transmitted to humans, committees were constituted by the government. The government has

³ Tacon AG, Metian M. "Aquaculture feed and food safety" *Ann N Y Acad Sci.* 50 (2008). Available at <https://pubmed.ncbi.nlm.nih.gov/18991902>

⁴ Rachael Gleason, "Poisoning Michigan: Author revisits PBB crisis 30 years Later" *Great Lakes Echo*, Jun. 4, 2010.

Before the BSE the accidental mixing of Polybrominated biphenyl (PBD) flame retardant to feed led to widespread poisoning of people in Michigan USA in 1970. The poisoning in humans was the result of the consumption of animal meat fed on feed contaminated with PBD.

⁵ All About BSE (Mad Cow Disease), *available at:* <https://www.fda.gov/animal-veterinary/animal-health-literacy/all-about-bse-mad-cow-disease#:~:text=A%20cow%20gets%20BSE%20by,its%20first%20year%20of%20life.> (Accessed on May 25, 2022).

⁶ Onsando Osiemo ,*Food Safety and Standards in International Trade*, 60 (Routledge, London and Newyork, 2017)

constituted two committees viz: Southwood Working Party and Tyrell Consultative Committee in order to investigate and report on different aspects of BSE and the allied risks posed by it to human health⁷

The Southwood Working party report was published in 1989. The reports assured that there is least probability of transference of infections from animals to humans. The infected animals are dead-end hosts to infections.

The Tyrell Committee submitted its report in the year 1990 wherein the committee supported the results of the Southwood Committee, however suggested the Government to study the link between BSE and nvCJD in humans.

Further, studies have revealed that infected animals are a potent source for the transmission of infections to humans. The government has also admitted the fact and changed its stance in the year 1996 by publishing a report clarifying that there are sufficient pieces of evidences to prove that nvCJD in humans was caused by BSE-infected animals.⁸

IV. Transmission of Infections

BSE was detected in ten countries and areas outside the UK by October 1996.⁹The infection affected native animals in France, Portugal, Ireland, and Switzerland, owing to the consumption of cattle feed imported from the United Kingdom.¹⁰ The cattle imported from United Kingdom were found infected with BSE in Canada, Denmark, Falkland Islands, Germany, Italy, and Oman.¹¹ Till the year 2019, 232 people worldwide have become sick with vCJD which is the version of BSE and all have died. The cause of their death has been detected as the consumption of food made from cows sick with BSE.¹² The pieces of evidence of transmission of infections from animals infected by consumption of unsafe feed were not limited to the United Kingdom. The instances of such incidents were also found in the United States of America. In the United States of America, animal feed has frequently been found contaminated with Non-Typhoidal serotypes of *Salmonella enterica* which has led to the infection of animals fed on that food.

⁷BSE outbreak: initial government response, *available at*:<https://navigator.health.org.uk/theme/bse-outbreak-initial-government-response> (Accessed on Jan. 20, 2022).

⁸ Jon Johnson, "Can humans get mad cow disease" *Medical News Today*, Dec. 8, 2020.

⁹ Peter G Smith, Ray Bradley, Bovine spongiform encephalopathy (BSE) and its epidemiology, 66 *Br. Med. Bull.* 185-198 (2003). Also available at <https://doi.org/10.1093/bmb/66.1.185>

¹⁰ Creutzfeldt-Jakob Disease (CJD) available at: <https://ldh.la.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/EpiManual/CJDManual.pdf> (Accessed on Dec. 10, 2021).

¹¹ Opinion of the SSC on the Human Exposure Risk (HER) via food with respect to BSE, *available at*: <https://www.mhlw.go.jp/shingi/2003/04/dl/s0417-4c.pdf> (Accessed on Nov. 27, 2022).

¹² *Supra note 5.*

These bacteria can infect animal carcasses or cross-contaminate other foods, resulting in human illness.¹³ In the year 1948, non-Typhi serotypes of *S. enterica* were found in poultry feed in the United States. The studies conducted all around the world substantiated the existence of *Salmonella enteric* in varieties of animal feed. In the year 1993, the Food and Drug Administration (FDA) of United States of America evaluated samples from 78 rendering facilities that generated animal protein-based animal feed and 46 feed mills that produced vegetable protein-based animal feed for the presence of *S. enteric* which was found in 56 percent of animal protein samples and 36 percent of vegetable protein samples.¹⁴ The studies substantiated that the animal feed contaminated with salmonella is the major cause of transmission of infections. Non-typhoidal *Salmonella* has been identified as a major cause of gastrointestinal illness.¹⁵ The global yearly incidence of non-typhoidal *Salmonella*-related acute gastroenteritis in humans is estimated to be over 153 million, with 56,969 deaths.¹⁶ Majority of the cases reported are food borne. The studies substantiated that the animal feed contaminated with salmonella is the major cause of transmission of infections. Another incident that substantiated the adverse effects of contaminated feed is the Melamine incident. The contamination of the infant formula by melamine came to the fore in the year 2008 in China. Melamine is a high nitrogen chemical compound that appears to have been added to diluted milk in order to give semblance of the normal protein levels when tested using a nitrogen content test.¹⁷ China's Ministry of Health reports that 39,965 babies have been treated after the intake of baby formula. In total, 12,892 infants were hospitalized, among them, 104 were in critical condition. Three confirmed deaths and one unconfirmed fatality have been recorded. The unauthorized addition of food and feed to

¹³ John A. Crump, Patricia M. Griffin, Frederick J. Angulo, "Bacterial Contamination of Animal Feed and Its Relationship to Human Foodborne Illness" 35 *Clinical Infectious Diseases*, 859-865 (2002). Also available at: <https://doi.org/10.1086/342885>

¹⁴ Amy R. Sapkota, Lisa Y. Lefferts, Shawn McKenzie, and Polly Walker "What Do We Feed to Food-Production Animals? A Review of Animal Feed Ingredients and Their Potential Impacts on Human Health" 115 *Environmental Health Perspectives*, 663-670 (2007).

¹⁵ Zafar, Samavia & Ajab, Huma & Mughal, Zaib-Un-Nisa & Ahmed, Jawaid & Baig, Sofia & Baig, Ayesha & Habib, Zeshan & Jamil, Farrukh & Jam, Muhammad & Kanwal, Sumaira & Rasheed, Muhammad, "Prediction and Evaluation of Multi Epitope Based Sub-Unit Vaccine Against *Salmonella typhimurium*" 29 *Saudi J. Biol. Sci.* 1092-99 (2022). Also available at: https://www.researchgate.net/publication/355013217_Prediction_and_Evaluation_of_Multi_Epitope_Based_Sub-Unit_Vaccine_Against_Salmonella_typhimurium

¹⁶ Kirk MD, Pires SM, Black RE, Caipo M, Crump JA, Devleeschauwer B, et al., "World Health Organization Estimates of the Global and Regional Disease Burden of 22 Foodborne Bacterial, Protozoal, and Viral Diseases, 2010: A Data Synthesis. 12 *PLoS Med.* (2015).

boost the apparent protein content of food and feed products was shown to be the source of contamination.¹⁸

V. Importance of Ensuring Safety of Feed

The concept of food safety can be understood by taking a holistic approach. In order to ensure the safety of food to humans, it is necessary to ensure the safety of animals. Food products containing animal ingredients cannot remain pure and safe for human consumption unless and until the raw material is produced in a regulated manner. The quality of animal-based foods for humans has been found to get affected by the feed which is fed to these animals. The safe feed allows farmers to improve animal health and wellbeing while reducing the need for antimicrobials, ensuring food safety, lowering production costs, and maintaining or improving food quality. Safe feed is also necessary for income generation and trade access, as well as reducing feed and food losses. The feed production, both at feed manufacturing plants and on-farm, must be subjected to integrated safety systems for quality assurance, much as food production.¹⁹ The contamination of feed with undesirable substances is a risk for both animals as well as for human health.²⁰ The health status of the animals is bound to deteriorate in the presence of toxic (undesirable) substances, increasing the risk of infectious diseases. It may raise the danger of diseased animal products containing microbiological pollutants entering the food supply and may lead to the ever increasing use of antimicrobials (antibiotics). The consequence of the unabated use of antibiotics is the spread of antibiotic-resistant bacteria over the world. It is essential to communicate these different risk scenarios to risk managers, stakeholders, and consumers.²¹ All these incidents call for proactive measures so as to curb the contamination of feed to protect humans from food-borne diseases. Thus, it was opined that effective regulation of the feed manufacturing industries is *sin qua non* for ensuring the safety of humans.

VI. Feed Market

¹⁸ Melamine, Available at <https://www.fao.org/food/food-safety-quality/a-z-index/melamine/en/> (Accessed on Mar, 24 2022)

¹⁹ Dr. Rishav Kumar, Animal Nutrition : Feed and Feeding, *e Pashupalan*, Sep. 12, 2020.

Also available at <https://epashupalan.com/6924/animal-nutrition/animal-nutrition-feed-feeding>

²⁰ Albert G. J. Tacon and Marc Metian, "Aquaculture Feed and Food Safety: The Role of the Food and Agriculture Organization and the Codex Alimentarius" 1140 *Ann. N.Y. Acad. Sci.* 50–59 (2008).

²¹ Thorne ps, "Environmental Health Impacts of Concentrated Animal Feeding Operations: Anticipating Hazards – Searching for Solutions" 115, *Environ Health Perspect* 296–297(2007).

Animal feeds have been commercially sold and manufactured since 1800 AD. The type of feed mainly used by the commercial farmers is Compound feed²². Compound feeds are mixtures of numerous additives and basic materials tailored to the needs of the target animal. The yearly output of compound feed in the world is estimated to be around one billion tones. Food industry contributes about \$400 billion revenue worldwide annually.²³ In the year 2019, the size of cattle feed market reached \$73.5 billion and is expected to reach \$78.3 billion by the year 2027.²⁴ The economies of many countries heavily rely on the feed business. According to the American Feed Industry Association, feed components cost an average of \$20 billion each year. The feed industry plays an important role in maintaining the quality of food and ensuring safe and nutritious food for humans. The exponential rise of feed market indicates the urgent attention required in order to arrest the growing concerns of stakeholders concerning the communicable disease transmitted from animals to humans.

VII. Legislative Measures at International Level

i) Codex Alimentarius Commission (CAC) and Animal Feed.

The United Nations Food and Agriculture Organization (FAO) and the Codex Alimentarius Commission (CAC) were instrumental in the formulation of international standards, guidelines, and recommendations to safeguard consumer health and maintain fair trade practices in the food industry.²⁵ In the year 1962, CAC was founded in order to carry out the Joint Food Standards Programme of the FAO and the World Health Organization (WHO). CAC is an international risk management authority that formulates food safety and quality standards.²⁶ These standards are utilized by policymakers and regulators in developing a foolproof national food control system so as to ensure acceptable food quality and safety, as well as to safeguard consumers' health at the national level.²⁷

²² Types of Animal Feed, *available at:*

<https://animals.mom.com/types-of-animal-feed-3417695.html> (Accessed on July, 14 2021)

²³ Global Feed Statistics, *available at:*

International Feed Industry Federation – Global Feed Statistics (ifif.org) (Accessed on Feb 12, 2022).

²⁴ Allied Market Research, *available at:* <https://www.alliedmarketresearch.com/cattle-feed-market-A09494> (Accessed on 24,A pr. 2022)

²⁵ *Supra note 3.*

²⁶ Codex Alimentarius work relating to food safety of coffee, *available at:* <https://www.ico.org/documents/ed2015e.pdf> (Accessed on Jan. 15, 2022)

²⁷ Mansoor, S. I. U., & Chopra, M. (2020). Article XX Of GATT: Territoriality Of Unilateral Trade Measure And Sustainable Development. *Ilkogretim Online*, 19(4), 7784-7792.

It establishes safety standards for all major foods, whether processed, semi-processed, or raw, for consumer distribution.²⁸ Food hygiene, food additives, pesticide and veterinary medication residues, pollutants, milk, meat, fruits and vegetables, processed food, labelling and presentation, techniques of analysis and sampling, and import and export inspection and certification are all covered by Codex.²⁹ The codex contains two types of standards one is horizontal and another is vertical. Horizontal standards are those that apply to all foods, specific foods, or food groups in general.³⁰ The standard for hygiene, food additives, contaminants, toxins, and residues are horizontal standards. These standards are required to be complied while manufacturing feeds also.³¹

In order to address the matter of contaminated feed and to chalk out the future guidelines to regulate the feed industry, the FAO held an Expert Consultation on Animal Feeding and Food Safety in Rome in the year 1997. In response to an effort by then-FAO Director-General Jacques Diouf, the Expert Consultation on Animal Feeding and Food Safety was convened.³² The Expert Consultation framed a draft code for the feed industry and submitted it to Codex for consideration.³³ The draft code stressed on adherence to Good Manufacturing Practices during the procurement, handling, storage, processing, and distribution of feed meant for food-producing animals.³⁴ The issues of pathogenic bacteria, mycotoxins, veterinary medication residues, pesticide residues, and heavy metals in animal feed were all addressed in the proposed code. The Code's major focus, however, was on the suspected relationship between BSE and Creutzfeldt-Jakob Disease (nvCJD).

Thus, an urgent need was felt by the commission to develop international guidelines and recommendations which will address all the issues relating to animal feeding. Further, the exponential rise

²⁸ World Trade Organisation, *available at*: https://www.wto.org/english/tratop_e/dispu_e/320r_e_e.pdf (Accessed on May. 17, 2022).

²⁹ Codex Alimentarius International Food Standards, *available at*: <http://web.archive.org/web/20220428174214/https://www.fao.org/fao-who-codexalimentarius/about-codex/en> (Accessed on Mar. 20, 2022).

³⁰ Coordinating Horticultures Response to Codex, *available at*: <https://ausveg.com.au/app/data/technical-insights/docs/AH99014.pdf> (Accessed on Mar. 12, 2022).

³¹ Mansoor, S. I. U. (2022). WTO and Developing Nations: Disparities in the WTO Dispute Settlement Mechanism. *International Journal of Early Childhood Special Education (INT-JECSE)* DOI: 10.9756/INT-JECSE/V14I2.490 ISSN:1308-5581 Vol 14, Issue 02, 2022, 14(2), 4441–4449. <https://doi.org/10.9756/INT-JECSE/V14I2.490>

³² Food and Agriculture Organisation, *available at*: https://www.fao.org/waicent/ois/press_ne/presseng/1997/pren9724.htm (Accessed on Nov. 18, 2021).

³³ *Supranote 3.*

Food and Aquaculture Organization. Animal feeding and food safety. *Food and Nutrition Paper* 69. 48 pp. FAO, 1998. Rome. <http://www.fao.org/docrep/w8901e/w8901e00.htm>

³⁴ The Codex Code of Practice on Good Animal Feeding, Joint FAO/WHO Foods Standards Programme 2004 *available at*: <https://aanzfta.asean.org/AECSP/ASEAN-SPS-Guide/files/media/2020/09/Codex-Code-of-practice-on-good-animal-feeding.pdf> (Accessed on Dec. 16, 2021)

in the export and import of trade attracted the attention of CAC to regulate the feed industry. To cater to the need, the Codex in its 23rd Session in the year 1999 recommended the establishment of an Ad Hoc Intergovernmental Task Force on Animal Feeding (TFAF). The host government of TFAF was Denmark. The outcome of the TFAF was the development of the Codex Code of Practice on Good Animal Feeding.³⁵ The Code was adopted by CAC in the year 2004. Till then there existed no direct regulation for governing the manufacture and processing of the feed industry. The application of the Code on feed manufacturing will ensure the safety of food products having animal origin. Section 3 of the Code of Practice on Good Animal Feeding defined Feed as

"Any single or multiple materials, whether processed, semi-processed or raw, which is intended to be fed directly to food-producing animals" and

Undesirable Substances means, "contaminants and other substances which are present in/or on feed and feed ingredients and which constitute a risk to consumer's health, including food safety-related animal health issues."

The focus of the Code of Practice on Good Animal Feeding remained to address the food-borne illness caused in humans due to consumption of products manufactured through the use of animals infected by contaminated feed.

The Code has laid the following principles and requirements for adherence by feed industries:

- a) The feed and its ingredients should be kept in such conditions that will protect it from chemical, physical and microbiological contamination.
- b) In order to control risks in food, Good Manufacturing Practices³⁶ (GMP) and Hazard Analysis and Critical Control Point³⁷ (HACCP) principles are required to be complied.
- c) After conducting a thorough risk analysis, feed raw materials and feed components should be procured from safe sources. Working Principles for Risk Analysis for Application in the Codex Alimentarius Framework should be followed.³⁸

³⁵ *Supra note 32.*

³⁶ **Good Manufacturing Practice** (GMP) is a system for ensuring that products are consistently produced and controlled according to quality standards.

³⁷ HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement, and handling, to manufacturing, distribution, and consumption of the finished product.

- d) The feed must be properly labeled, containing proper information in respect of the species to which the feed is intended to be used, a list of ingredients used in the feed, the contact information of the manufacturer, registration number of the lot, directions, and precautions for use, manufacturing date, use before and expiry date.
- e) The manufacturers shall ensure traceability by maintaining proper records of the sale. Maintenance of proper records ensures timely and effective withdrawal or recall of products that could have adverse effects on consumer health.
- f) In the event of emergency, the manufacturers shall act swiftly as soon as they get information from the competent authorities. Manufacturers must take adequate measures to ensure that feed does not endanger the health of customers.
- g) The concentration of unwanted chemicals in food for human consumption must be maintained as low as feasible. The levels should be kept under the Codex Maximum Residue Limits and Extraneous Maximum Residue Levels established for feed.³⁹
- h) Feed additives and veterinary pharmaceuticals used in medicated feed must adhere to the rules of the Codex Recommended International Code of Practice for the Control and Use of Veterinary Drugs and additives.

ii) Documentation on Animal Feed & CAC.

Subsequent to the adoption of the Code, the studies and research for making better provisions so as to ensure safety of feed continued; which in turn has led to the formulation and adoption of two texts on animal feeding in the year 2013 by Codex in its 36th Session.⁴⁰ The Ad-hoc Codex Intergovernmental Task Force on Animal Feeding, which was hosted by the Swiss government, created both guiding

³⁸ Appendix III: Proposed Draft Codex Working Principles for Risk Analysis *available at:* <https://www.fao.org/3/x7101e/x7101e0g.htm> (Accessed on May. 25, 2022)

³⁹ Codex Maximum Residue Limits and Extraneous Maximum Residue Levels established for feed *available at:* <https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXM%2B2%252FMRL2e.pdf> (Accessed on Nov. 19, 2021).

⁴⁰ United States Department of Agriculture, *available at:* 36th Session, Codex Alimentarius Commission (usda.gov) (Accessed on Jan. 10, 2022).

documents. The two new documents were added to Codex Alimentarius.⁴¹ The important documents framed and approved by codex are:

- i) Guidelines on Application of Risk Assessment for Feed⁴² laid down specific science-based risk assessment criteria applicable to feed contaminants
- ii) Guidance for Use by Governments in Prioritizing the National Feed Hazards⁴³ in feed ingredients and feed additives. The aim of the document was to assist governments in prioritizing the list of hazards and taking into consideration the possibility of transmission of contaminants present in feed to edible animal products.

The purpose of the two texts is to prevent the transmission of hazards present in the feed to humans. The text lay down the procedures which are required to be observed by the members of CAC for checking the risks of transmission hazards from animal-based foods to humans. The policy for analysis of hazards must be framed keeping in view the local conditions in which it is manufactured. Compliance with the requisite guidelines will lead to smooth international trade and promotion of fair practices in the trade of food and feed.⁴⁴

VIII. Guidelines on Application of Risk Assessment for Feed.

The Guidelines on Application of Risk Assessment for Feed have laid elaborate provisions for the risk analysis. The three different and closely associated components of risk analysis are as under:

- i) Risk Assessment,
- ii) Risk communication, and
- iii) Risk Management.

⁴¹ Global Minor Use Portal *available at*:

<http://web.archive.org/web/20200221030654/http://www.gmup.org:80/intharm.htm>

⁴² Guidelines on the Application of Risk Application of Risk Assessment for Feed. CAC/GL 80-2013, *available at*:
https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXG%2b80-2013%252FCXG_080e.pdf&mshid=3ab1b5a4b0e111ecbaee03f7c7c35ee4 (Accessed on Feb, 15

2022).

⁴³ Guidance For Governments On Prioritizing Hazards In Feed. CAC/GL 81-2013 *available at*:
http://files.foodmate.com/2013/files_1817.html (Accessed on Mar. 20, 2022).

⁴⁴ FAO, Another Step Towards greater Feed Safety, July 29, 2013.

Available at https://www.fao.org/ag/againfo/home/en/news_archive/2013_Feed_and_food_safety.html

- i) **Risk Assessment:** Risk Assessment has to be based on scientific data and must adopt a structured approach by incorporating the four steps viz:
 - a) Hazard Identification.
 - b) Hazard Characterization.
 - c) Exposure Assessment.
 - d) Risk Characterization.

Risk assessment has evolved into a well-organized scientific method with clear criteria, significant data sourcing, and different statistical processes. Hazard identification and characterization, exposure assessment, and risk characterization are the four key aspects of a quantitative risk assessment. The end result of available techniques on risk assessment is health-based guidance levels expressed as acceptable, daily and weekly intake amounts that pose no or minimal harm to human health.⁴⁵ In the assessment of safety for feeds used in food-producing animals, the stratified technique has been made applicable and implemented.

ii) **Risk communication:**

It is the dynamic exchange of information and perspectives about risk throughout the risk assessment process. Risk management decisions are based on risk-related elements and risk perceptions among risk assessors, risk managers, consumers, industry, academia, and other interested parties, including the explanation of risk assessment findings.

iii) **Risk Management:**

The process includes analyzing policy choices (in conjunction with all interested parties), taking into account risk assessment, and other variables pertinent to consumer health protection and fair trade practices. Risk management is primarily concerned with the selection of appropriate prevention and control strategies. The selection of appropriate prevention and control options are the main objects of risk management. Risk management comprises of the following steps:

⁴⁵ Dorne JL. "Metabolism, variability and risk assessment" *Toxicology*" 268 *PMID* 156 (2010).

- i) Preliminary risk management actions, such as identifying a feed-related food safety issue, creating a risk profile, and ranking the hazard for risk assessment and risk management priority.
- ii) Establishing a risk assessment policy for the risk assessment's conduct; defining the risk assessment's output form; commissioning the risk assessment; and considering the risk assessment's possible outcomes.
- iii) Risk management options evaluation, implementation, monitoring, and review

IX. Guidance for Use by Governments in Prioritizing the National Feed Hazards.

The second important concern pertained to the Prioritization of hazards in feed. It is included in preliminary risk management activities, but it can be done at any time during the risk analysis process. In a risk analysis framework, the prioritization method assigns a ranking to various combinations of hazardous feed and consumable products. A defined prioritization approach offers openness and repeatability, as well as the opportunity to re-evaluate when new data becomes available without going through the entire process again. The following are the steps in the prioritization process:

- i) Spotting of the hazard/feed/edible product inherently related with food safety issues and may require prioritization for risk evaluation and handling.
- ii) Description and definition of the standard by virtue of which each pin pointed hazard/feed/edible product amalgamation will be counted. The standard employed to rank the hazard/feed/ edible product must be defined and should outline the object of identification.
- iii) Standard based values must be assigned to the hazard/feed/edible product combinations in order to determine the experts to be needed to hook the issue.
- iv) The values are required to be normalized so that same are made comparable between standards. Experts are required to carry out the process. Their relative importance is reflected in weighing of criteria.
- v) For each hazard/feed/edible product combination of weighted normalized values in order to produce a score, order of priority is obtained by ranking of scores for the purpose of yielding the prioritized list.

- vi) Combination of the weighted normalized values and reporting of the process, methods, and results.⁴⁶

These above steps were stipulated on account of Guidance for Use by Governments in Prioritizing the National Feed Hazards i.e., the second text which has been formulated in the year 2013. The purpose of prioritizing feed risks is to improve the safety of consumable products by better allocation of the resources needed for risk assessment and risk management. The document guides governments on prioritizing hazards in feed and feed ingredients by using the multi-criteria analysis approach. However, it also acknowledges the application of variety of other methods for prioritizing threats in feed industry.⁴⁷ The stipulations apply to the potential hazards in the feed of food-producing animals which may be the cause of worry for human health.⁴⁸ The effective implementation of the Codex guidelines on animal feed seemed to be difficult without providing an easy guide for the feed manufacturing industry. The efforts were started by FAO, and a Manual was published in the year 2010 with the help of the Standards and Trade Development Facility (STDF) established by FAO, the World Organization for Animal Health (OIE), the World Bank Group, the World Health Organization (WHO), and the World Trade Organization (WTO) with the support of FAO. Keeping pace with the emerging developments the Manual was revised in the year 2013.⁴⁹ The object of the Manual is to assist the feed manufacturers in implementing the Codex Code of Practice on Good Animal Feeding. The guidelines encompass the feed from farm to market. The Manual stresses the application of a risk-based approach in feed manufacturing. The feed manufacturing industry shall observe the principles of Hazard Analysis and Critical Control Points and Risk analysis so as to reduce foodborne risks to public health⁵⁰.

⁴⁶ Guidance For Governments On Prioritizing Hazards In Feed CACGL (2013) *available at:* http://files.foodmate.com/2013/files_1817.html (Accessed on Feb. 23, 2022).

⁴⁷ Working Principles for Risk Analysis for Food Safety for Application by Governments (CAC/GL 62-2007) *available at:* <https://www.fao.org/3/a1550t/a1550t.pdf> (Accessed on Feb. 26, 2022).

⁴⁸ *supra* 44, *also available at:* https://www.sfda.gov.sa/ar/food/about/administration/management_regulations/Documents/%D8%A7%D9%84%D8%A3%D8%AE%D8%B7%D8%A7%D8%B1_%D9%81%D9%8A_%D8%A7%D9%84%D8%A3%D8%B9%D9%84%D8%A7%D9%81_E.pdf (Accessed on Feb. 24, 2022).

⁴⁹ FAO and IFIF. 2020. Good practices for the feed sector – Implementing the Codex Alimentarius Code of Practice on Good Animal Feeding. FAO Animal Production and Health Manual No. 24. Rome. *available at:* <https://www.raiffeisen.de/sites/default/files/2020-11/CB1761EN.pdf> (Accessed on Mar. 26, 2022).

⁵⁰ Pellegrino Missaglia, A., Bruno, A., Battaglia, D. (eds.) “Good practices for the feed sector – Implementing the Codex Alimentarius Code of Practice on Good Animal Feeding” *FAO Animal Production and Health 24* Rome Italy, 2020. Available at <https://doi.org/10.4060/cb1761en> (Accessed on Feb. 26, 2022).

The manual is an attempt to guarantee that Codex standards are implemented effectively by stipulation of comprehensive information and practical instructions to farmers, producers, and other stakeholders in the feed chain; a great initiative so as to ensure the effective implementation of Codex regulations.

X. Indian Law on Animal Feed.

The problem of food contamination has been prevalent in Indian society since ancient times. The Kautilya in Arthashastra⁵¹ provides measures that could protect the consumers from the unfair practices of the dealers indulging in food adulteration. The prevalence of practices for guaranteeing safe food to humanity has been in place since times immemorial. In addition to ancient religious texts, various legislations have been enacted to provide safe foods for human consumption. The concept of safe feed albeit has remained untouched as the prime focus has been the safety of humans, not animals. The relation of giving safe food to animals so as to ensure quality food for humans was not recognized. The analysis of existing food safety laws, it revealed that those laws were not even remotely concerned with the safety of feed to humans. The only focus was to prevent direct adulteration of food for humans and not animals. The administration and regulation of contaminated feed to animals and their impact on human beings were unknown, however all countries admit the necessity for having such law⁵².

i) Indian Penal Code, 1860

Sections 272 and 273 of the Indian Penal Code, 1860 prescribed punishment for the persons indulging in the adulteration of food. The prerequisites for attraction of these sections are that the adulteration must be carried out by adding some noxious thing to the food or drink. Secondly, the mixing of obnoxious things must be intentional with the object of selling adulterated food to humans. The perusal of the provisions makes it abundantly clear that the aim and object of sections are to prevent direct contamination of food that might be available for human consumption. The connection between the safety of feed for animals and the subsequent effect of such feed on humans has remained to be addressed.

ii) Prevention of Food Adulteration Act, 1954.

⁵¹ An ancient Indian Sanskrit treatise on statecraft, political science, economic policy, and military strategy.

⁵² P.D. Limcango- Lopez, "Legislation and Quality Control of Feeds: The Experience of Asian Countries" available at: <https://www.fao.org/3/X6930E/X6930E12.htm> (Accessed on Feb. 26, 2022).

The Prevention of Food Adulteration Act, (PFA) was enacted to suppress, cure the glaring practice of food adulteration and to ensure the selling of quality food to the people.⁵³ The PFA regulated the food market in India for more than five decades. The PFA formulated and monitored standards of quality and purity in food. The PFA Act, 1954 laid emphasis only on adulteration. The legislation however was not comprehensive enough to deal with contamination of food through animal feed and its supply in the entire food chain.⁵⁴

iii) Food Safety and Standards Act, 2006.

The Food Safety and Standards Act, 2006 (FSA) was enacted to consolidate the laws relating to food. All existing legislations and orders relating to food have been subsumed into one integrated food law, i.e. the FSA. The definition of Food⁵⁵ under Section 3(1) (j) of FSA expressly excludes animal feed from its ambit. The debate in the Lok Sabha⁵⁶ at the time of passage of the FSA is testimony to the fact that the issue of exclusion of animal feed from the ambit of the Act was raised by Hon'ble members of Parliament. The contention of Hon'ble members was that, in the case of exclusion of animal feed from the definition of food, the avowed objectives of the Act would be affected. In spite of the objections, FSA was enacted without including animal feed within its ambit. The exclusion of animal feed from the definition of food depicts the parochial approach adopted by the legislature. The incorporation of animal feed in Section 3 of the FSSA would have effectively protected the health of animals and humans consuming animal-based food. Such a legal arrangement might have set the standards of accountability and mechanism of grievance redressal might have served deterrence to manufacturers of animal feed.

⁵³ Kumar's, *Prevention of Food Adulteration Act, 1954* 42 (Law Publishers (India) Pvt. Ltd, NewDelhi, 3rd edn.,2008).

⁵⁴ Editorial, "New food safety bill glosses over pesticide residue levels" *Hindustan Times*, Aug. 21, 2006. *available at*: New food safety bill glosses over pesticide residue levels | Latest News India - Hindustan Times. (Accessed on Apr. 12, 2022)

⁵⁵ Food means, "any substance, whether processed, partially processed, or unprocessed, which is intended for human consumption and includes primary food to the extent defined in clause (zk), genetically modified or engineered food or food containing such ingredients, infant food, packaged drinking water, alcoholic drink, chewing gum, and any substance, including water used into the food during its manufacture, preparation or treatment but does not include any animal feed, live animals unless they are prepared or processed for placing on the market for human consumption, plants, before harvesting, drugs and medicinal products, cosmetics, narcotic or psychotropic substances: Provided that the Central Government may declare, by notification in the Official Gazette, any other article as food for this Act having regards to its use, nature, substance or quality."

⁵⁶ Lok Sabha Debates, Fourteenth Lok Sabha, Session Number 8, (July 26, 2006). *available at*: Debate: Loksabha (loksabhaph.nic.in) (Accessed on Jan. 26, 2022).

The legislature perhaps has lost sight at the time of enacting FSA by not taking into account the developments taking place at the international level in respect of the regulation of animal feed. The Codex Commission felt the need of regulating animal feed in the year 1999, uptill then no regulation was framed for ensuring safe animal feed. The establishment of the Ad Hoc Inter-Governmental Task Force on Animal Feeding in the year 1999 was the first serious effort of the Commission. The Ad Hoc Commission developed the international guidelines and recommendations in the year 2013 and subsequently the commission was dissolved.⁵⁷ The Food Safety Authority of India (FSSAI) has acknowledged the adverse effect of unsafe feed on humans in the year 2018. In the National Milk Safety and Quality Survey of the year 2018 the presence of the Aflatoxin⁵⁸ M1 in the milk samples beyond permissible levels was found⁵⁹. As per FSSAI the presence of Aflatoxin in the Milk is due to feed and fodder which is yet to be regulated in India.⁶⁰In response to the findings of the survey, the FSSAI came up with a notification on December 10, 2019 in which direction was passed to concerned persons dealing in the manufacture of commercial feed to comply with the Bureau of Indian Standards (BIS), 2009. Before the notification the compliance with BIS certification for feeds was voluntary, but after the issuance of notification, the compliance of BIS certification became mandatory for commercial feeds.

iv) Bureau of Indian Standards.

The Bureau of Indian Standards (BIS) was established in India by an Act of Parliament known as the Bureau of Indian Standards Act, 1986. The BIS assumed control of the former Indian Standards Institute's workforce, assets, obligations, and duties.⁶¹ The BIS is presently regulated by Bureau of Indian Standards Act, 2016. Most processed foods available in India comply with the standards developed by the BIS. These standards cover raw material permitted and their quality parameters, hygiene conditions under which the product must be manufactured, and packaging and labeling requirements⁶². The producers who

⁵⁷ Vinod Kotwal, *Decoding Codex Alimentarius* 124 (Westville Publishing House, New Delhi, 1st edn., 2016).

⁵⁸ Aflatoxins are various poisonous carcinogens and mutagens that are produced by certain molds, particularly *Aspergillus* species.

⁵⁹ 368 Out of 6,432 samples taken 368 were found to be contaminated with Aflatoxin. 5.7% of the samples were contaminated.

⁶⁰ FSSAI, FSSAI Releases National Milk Quality Survey Report (Nov. 2018) *available at*: <https://foodsafetyhelpline.com/national-milk-quality-survey-report-2018/#:~:text=The%20survey%20was%20conducted%20over,and%205%25%20double%20toned%20milk.> (Accessed on Feb. 26, 2022).

⁶¹ Arushi Mishra, "All About Bureau of Indian Standards Act, 1986" *Latest Laws.Com*, July 28,2018. *available at*: <https://www.latestlaws.com/articles/all-about-bureau-of-indian-standards-bis-act-1986-by-arushi-mishra> (Accessed on Jan. 23, 2022).

⁶² IGNOU, "Consumer Laws Governing Goods" (June, 2018) *available at*: <https://egyankosh.ac.in/bitstream/123456789/49951/1/Block-3.pdf> (Accessed on May. 26, 2022).

comply with BIS standards can obtain ISI Mark. BIS certification is voluntary. However, for several products, BIS certification is made compulsory by the Central Government in the public interest. The protection of humans, animal or plant health, the safety of the environment, prevention of unfair trade practices, and national security is the prime object of BIS. For the products that require compulsory BIS certification, the Central Government mandates the use of the Standard Mark under a license or Certificate of Conformity from BIS.⁶³ The BIS grants license on application however the enforcement of compulsory certification as required for animal feed is carried out by FSSAI.

Even after the enactment of FSA, animal feed is regulated by BIS standards. The standards for feed are governed by IS 2052:2009⁶⁴. The BIS standards were first introduced in 1962 and were revised with time so as to keep track on new developments in the feed industry. To address the growing concern for health and consumer safety the 4th Revision of Indian Standards, Compounded Feeds for Cattle Specifications were adopted by BIS in 2009. The Standards applied to cattle.

XI Indian Standards Institute (ISI) and BIS

The 2009 standard has laid down the requirements that the feed industry has to comply with during the manufacture of compound feed for meat and milk-producing animals. The standard guides the manufacturers from the production of feed to its sale in the open market. The important pre-requisites for guaranteeing safe feed are:

- i) The feed manufacturers shall ensure that the feed produced is free from harmful constituents, metallic pieces, and free from adulteration.
- ii) The feed must be devoid of fungus, bug infestation, fermentation, and any other offensive odours.
- iii) The compounded feed shall be packed in clean bags.
- iv) The bags shall be labeled with proper information so as to the type of material, name, and address of the manufacturer, Batch or Code number, Aflatoxin Content, Urea present, Date of Manufacture, and Best Before and directions for use.
- v) The compounded feed manufacturers shall check the feed before placing it on market.⁶⁵

⁶³Bureau of Indian Standards, Products under compulsory Certification. *available at:*

Products under Compulsory Certification - Bureau of Indian Standards (bis.gov.in) (Accessed on May. 26, 2022).

⁶⁴BIS Certification for Compounded Cattle Feeds, *available at:* ISI MARK FOR COMPOUNDED FEEDS FOR CATTLE IS 2052:2009 - Aleph INDIA (Accessed on Jan. 16, 2022).

⁶⁵ Bureau of Indian Standard, Indian Standard Compounded Feeds for Cattle Specification, Fourth Revision (June 2009)

The BIS 2009 standards were made compulsory by FSSAI for commercial feed and feed materials. The directions were issued on December 10, 2019 under Section 16(5) of the FSS Act, 2006. Section 16(5) vests power in the food authority to aid and assist Central Government in framing regulations for the protection of the health of the people. The FSSAI made it clear that the application of BIS standards is an interim measure till the feed regulations are framed. The FSSAI direction prohibited the manufacture, sale, distribution, and import of feed without the BIS certification mark. The need for issuance of these directions was felt by the FSSAI when the food products of animal origin were found to be non-compliant with the relevant food quality and safety standards.⁶⁶ The FSA was found to be not complied with as far as the requirements pertaining to pesticides, heavy metals, and Aflatoxin M1 are concerned. The feed and fodder being the primary sources of contamination, hence FSSAI had felt the need for regulatory control of animal feeds. The FSSAI felt the necessity for regulatory supervision of animal feeds to prevent contaminants from entering the food chain via feed and fodder.⁶⁷ The direction made BIS standards mandatory for commercial feeds meant for food-producing animals only. The direction excludes feed meant for pets and other animals thereby threatening the safety of humans. The time frame for complying with the directions was fixed as six months i.e., June 10, 2020. However, the directions were amended by FSSAI on January 27, 2020 to restrict the scope of the earlier direction. As per the amended direction, the BIS certification is mandatory only for compounded commercial feed for cattle. Earlier direction covered all feeds under BIS, but after amended directions only compounded feed is regulated. The implementation date for new regulations was fixed as of July 2020. On July 24, 2020, the FSSAI extended the compliance date to January 2021. The compliance date for meat and milk-producing animals was again revised to July 2021 and due to Covid 19, the final date of compliance was set as January 1, 2022. From 2022 BIS certification is mandatory for commercial compounded feed for cattle.⁶⁸

Available at <https://law.resource.org/pub/in/bis/S06/is.2052.2009.pdf> (Accessed on Mar. 26, 2022).

⁶⁶SINTEF Ocean AS, Regulations on the use of rest raw materials from seafood processing in EU and India,(2020) Also available at https://sintef.brage.unit.no/sintef-xmlui/bitstream/handle/11250/2655279/D4.2_Regulations_SINTEF%20Report%20final_edited.pdf?isAllowed=y&sequence=7 (Accessed on Jan. 08, 2022).

⁶⁷Menakshi Verma Ambwani, “FSSAI mulls cattlefeed norms to curb animal food contamination” Business Line, Dec.13, 2019. Also available at: [FSSAI_News_Adulteration_BusinessLine_16_12_2019.pdf](https://www.businessline.com/story/fssai-news-adulteration-businessline-16-12-2019.pdf) (Accessed on May. 26, 2022).

⁶⁸U.S Department of Agriculture, India: FSSAI Extends Compliance Deadline for Feed Standards for Select Stakeholders (July 30,2021) Also available at: India: FSSAI Extends Compliance Deadline for Feed Standards for Select Stakeholders | USDA Foreign Agricultural Service (Accessed on May. 26, 2022).

However, FSSAI has advised Commissioner(s) of Food Safety of all States/ Union Territories and Central Licensing Authorities to direct the concerned Food Safety Officers (FSOs) under their jurisdiction to desist from sampling of Soyabean De-Oiled Cakes or Soyabean Meals *intended* for use in poultry and animal feed while drawing samples of the products in exercise of the powers conferred upon them under Section 38 of the Act, The said clarification is based on the reason that the products intended for animal feed do not fall under the definition of food as defined under Section 3(1)(j) of FSS Act,2006.⁶⁹

The above clarification depicts perfunctory approach adopted by the FSSAI. The FSSAI on one hand has directed the compliance of BIS as mandatory and on the other hand has advised the Food Safety Commissioners of all States/ UTs not to take samples of products intended for use in animal feed. The legislative lacuna is a hiccup in efficient and effective implementation of even BIS. The cure lies in the amendment of FSA Act, 2006 by the inclusion of animal feed within its ambit. It is apposite to highlight that consumption of animal based products by human beings is on rise; therefore, by not paying attention to this grave issue, the legislature is doing more harm than good to the humanity.

XII. Conclusion

The efforts of FSSAI to regulate animal feed are appreciable; still the journey is distant to be conquered. The extant adhoc compliance to Bureau of Indian Standards (BIS) standards in order to regulate the feed industry is an interim measure. However, the fool-proof regulations are needed on the issue by FSSAI to achieve the desired objectives. The FSSAI must in addition to regulation of compounded feed, cover all types of feeds. Secondly, the BIS standards are made applicable to feed to be used for the consumption of food-producing animals, while as leaving the feed manufactured for the pets and other animals as such. This dichotomy is not based on reasons or any scientific study, therefore, the exclusion of feed to be utilized for the purpose of pets and other animals needs to be revisited. The seemingly aim and objective of FSA is to achieve safe and wholesome food for humans without caring for the welfare and safety of animals. The FSSAI must adopt the best practices consistently evolved in the development of feed laws in the United States of America and other developed countries. Inclusion of risk analysis, good manufacturing practices, hazard analysis, and critical control points into the manufacturing process is recommended in order to avoid the hassles occurring during the process. Compliance of these principles

⁶⁹ File No. RCD/ 15001/6/2021-Regulatory-FSSAI (E-1475) dated 17.Dec. 2021. *available at:* https://fssai.gov.in/upload/advisories/2021/12/61bc71760eefClarification_Sampling_Poultry_Animal_Feed_17_12_2021.pdf (Accessed on Jun. 26, 2022).

will help the manufacturers in identifying and eliminating the hazards that endanger product safety. Last but not least amendment is required to be made in FSA Act, 2006 for the inclusion of animal feed viz a viz proper statutory backing.

References

1. S.V.R.K. Prabhakar, Daisuke Sano and Nalin Srivastava, *Food Safety in the Asia-Pacific Region: Current status, Policy Perspectives, and a way Forward*, 215-238 (Institute for Global Environmental Strategies, Hayama, Japan).
2. Frazzolic, Mantovania, “Toxicants Exposures as Novel Zoonoses: Reflections on Sustainable Development Food Safety and Veterinary Public Health” *57 Zoonoses and Public Health* e136–e142 (2010).
3. Tacon AG, Metian M. “Aquaculture feed and food safety” *Ann NY Acad Sci.* 50 (2008). Available at
4. <https://pubmed.ncbi.nlm.nih.gov/18991902>
5. Rachael Gleason, “Poisoning Michigan: Author revisits PBB crisis 30 years Later” *Great Lakes Echo*, Jun. 4, 2010.
6. Onsando Osiemo, *Food Safety and Standards in International Trade*, 60 (Routledge, London and Newyork, 2017)
7. Jon Johnson, “Can humans get mad cow disease” *Medical News Today*, Dec. 8, 2020.
8. Peter G Smith, Ray Bradley, Bovine spongiform encephalopathy (BSE) and its epidemiology, 66 *Br. Med. Bull.* 185-198 (2003). Also available at <https://doi.org/10.1093/bmb/66.1.185>
9. Creutzfeldt-Jakob Disease (CJD) available at: <https://ldh.la.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/EpiManual/CJDManual.pdf> (Accessed on Dec. 10, 2021).
10. Opinion of the SSC on the Human Exposure Risk (HER) via food with respect to BSE,
11. *available at:* <https://www.mhlw.go.jp/shingi/2003/04/dl/s0417-4c.pdf> (Accessed on Nov. 27, 2022).
12. John A. Crump, Patricia M. Griffin, Frederick J. Angulo, “Bacterial Contamination of Animal Feed and Its Relationship to Human Foodborne Illness” *35 Clinical Infectious Diseases*, 859–865 (2002). Also available at: <https://doi.org/10.1086/342885>
13. Amy R. Sapkota, Lisa Y. Lefferts, Shawn McKenzie, and Polly Walker “What Do We Feed to Food-Production Animals? A Review of Animal Feed Ingredients and Their Potential Impacts on Human Health” *115 Environmental Health Perspectives*, 663-670 (2007).
14. Zafar, Samavia & Ajab, Huma & Mughal, Zaib-Un-Nisa & Ahmed, Jawaid & Baig, Sofia & Baig, Ayesha & Habib, Zeshan & Jamil, Farrukh & Jam, Muhammad & Kanwal, Sumaira & Rasheed, Muhammad, “Prediction and Evaluation of Multi Epitope Based Sub-Unit Vaccine Against Salmonella typhimurium” *29 Saudi J. Biol. Sci.* 1092-99 (2022). Also available at: https://www.researchgate.net/publication/355013217_Prediction_and_Evaluation_of_Multi_Epitope_Based_Sub-Unit_Vaccine_Against_Salmonella_typhimurium
15. Kirk MD, Pires SM, Black RE, Caipo M, Crump JA, Devleesschauwer B, et al., “World Health Organization Estimates of the Global and Regional Disease Burden of 22 Foodborne Bacterial, Protozoal, and Viral Diseases, 2010: A Data Synthesis. *12 PLoS Med.* (2015).
16. Melamine, *Available at* <https://www.fao.org/food/food-safety-quality/a-z-index/melamine/en/> (Accessed on Mar, 24 2022)
17. Dr. Rishav Kumar, Animal Nutrition : Feed and Feeding, *e Pashupalan*, Sep. 12, 2020.
18. Albert G. J. Tacon and Marc Metian, “Aquaculture Feed and Food Safety: The Role of the Food and Agriculture Organization and the Codex Alimentarius” *1140 Ann. N.Y. Acad. Sci.* 50–59 (2008).
19. Thorne ps, “Environmental Health Impacts of Concentrated Animal Feeding Operations: Anticipating Hazards – Searching for Solutions” *115, Environ Health Perspect* 296–297(2007).
20. Codex Alimentarius work relating to food safety of coffee, *available at:* <https://www.ico.org/documents/ed2015e.pdf> (Accessed on Jan. 15, 2022)

21. Mansoor, S. I. U., & Chopra, M. (2020). Article XX Of GATT: Territoriality Of Unilateral Trade Measure And Sustainable Development. *Ilkogretim Online*, 19(4), 7784-7792.
22. Codex Alimentarius International Food Standards, *available at*: <http://web.archive.org/web/20220428174214/https://www.fao.org/fao-who-codexalimentarius/about-codex/en> (Accessed on Mar. 20, 2022).
23. Mansoor, S. I. U. (2022). WTO and Developing Nations: Disparities in the WTO Dispute Settlement Mechanism. *International Journal of Early Childhood Special Education (INT-JECSE)* DOI: 10.9756/INT-JECSE/V14I2.490 ISSN:1308-5581 Vol 14, Issue 02, 2022, 14(2), 4441-4449. <https://doi.org/10.9756/INT-JECSE/V14I2.490>
24. Food and Aquaculture Organization. Animal feeding and food safety. *Food and Nutrition Paper* 69. 48 pp. FAO, 1998. Rome. <http://www.fao.org/docrep/w8901e/w8901e00.htm>
25. The Codex Code of Practice on Good Animal Feeding, Joint FAO/WHO Foods Standards Programme 2004 *available at*: <https://aanzfta.asean.org/AECSP/ASEAN-SPS-Guide/files/media/2020/09/Codex-Code-of-practice-on-good-animal-feeding.pdf> (Accessed on Dec. 16, 2021)
26. Appendix III: Proposed Draft Codex Working Principles for Risk Analysis *available at*: <https://www.fao.org/3/x7101e/x7101e0g.htm> (Accessed on May. 25, 2022)
27. Dorne JL. "Metabolism, variability and risk assessment" *Toxicology* 268 *PMID* 156 (2010).
28. Guidance For Governments On Prioritizing Hazards In Feed CACGL (2013) *available at*: http://files.foodmate.com/2013/files_1817.html (Accessed on Feb. 23, 2022).
29. Working Principles for Risk Analysis for Food Safety for Application by Governments (CAC/GL 62-2007) *available at*: <https://www.fao.org/3/a1550t/a1550t.pdf> (Accessed on Feb. 26, 2022).
30. Pellegrino Missaglia, A., Bruno, A., Battaglia, D. (eds.) "Good practices for the feed sector – Implementing the Codex Alimentarius Code of Practice on Good Animal Feeding" *FAO Animal Production and Health* 24 Rome Italy, 2020. Available at <https://doi.org/10.4060/cb1761en> (Accessed on Feb. 26, 2022).
31. Kumar's, *Prevention of Food Adulteration Act, 1954* 42 (Law Publishers (India) Pvt. Ltd, NewDelhi, 3rd edn.,2008).
32. Arushi Mishra, "All About Bureau of Indian Standards Act, 1986" *Latest Laws.Com*, July 28,2018. *available at*: <https://www.latestlaws.com/articles/all-about-bureau-of-indian-standards-bis-act-1986-by-arushi-mishra> (Accessed on Jan. 23, 2022).
33. Menakshi Verma Ambwani, "FSSAI mulls cattlefeed norms to curb animal food contamination" *Bussiness Line*, Dec.13, 2019. Also *available at*: [FSSAI_News_Adulteration_BusinessLine_16_12_2019.pdf](https://www.fssai.gov.in/News/Adulteration_BusinessLine_16_12_2019.pdf) (Accessed on May. 26, 2022).