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The Doctrine of Karma: Understanding the Close Linkage of Action and Consequence in the Context of Foot-and-Mouth Disease

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Abstract

Foot-and-mouth disease (FMD), a long known and the first animal viral disease to be scientifically identified is a highly contagious disease afflicting even-toed animals. FMD virus is the most important pathogen due to its high transmission rate entangled with huge productive and economic losses upon incursion into the nations declared to be disease-free. The exponential growth in global trade has not only been the reason for immense benefits to mankind, but also negatively impacted in catalyzing the spread of different pests and pathogens. Such trade irrespective of the country-barrier has triggered outbreaks of several other emergency animal diseases than FMD, like ASF, CSF, SVD and PRRS in disease-free countries. This nut-shell-compilation focuses on how illegal trades have introduced FMD into disease-free countries. The title has been interwoven with the core narrative of the Indian philosophy that stresses upon a close relationship between action and consequence within the ambit of FMD.

Keywords: FMD, Illegal, Trade, Transmission

Introduction

Foot-and-mouth disease (FMD) is a highly contagious animal disease tremendously decimating the economy with annual estimated loss of INR 20,000 crores in India. It cripples the financial backbone of the nations through trade restrictions of livestock and products imposed by the World Organization for Animal Health (WOAH). Illegal introduction of meat products and swill feeding have triggered the outbreaks of classical swine fever (CSF) in the European Union in the 2000's and African swine fever (ASF) in Eastern Europe in 2007. The introduction of FMDV into disease-free nations is frequently linked to illegal activities, with illegal trade posing a risk of virus introduction up to 6.9 times higher than legal trade per kilogram facilitating the entry of the virus through infected animals, products, or contaminated materials.

To remain deeply connected to our roots, it is essential to revisit history time and again and turn its pages. If we look back at history, we can encounter examples how trade of animal and products have been responsible for FMD outbreaks in Albania in 1996 due to lax trade policy and Taiwanese outbreak in 1997, where illegally imported feed/pigs was the blamed culprit. Moving further back, during 1871-1872, five FMD episodes were reported in Australia in cattle originating from the UK, either meant for Australia, in quarantine or in a bull landed two months before (Fisher, 1984). The last FMD outbreak during 1929 in the USA was from infected hogs fed swill with meat scraps from a tourist steamship from Argentina. In the paper, we will see how illegal trades of animals and derived products have played a crucial role driving the introduction of FMD into disease-free countries along with the involved risk factors.

Illegal Activities behind FMDV Incursions and Associated Risk Factors

1. Unregulated Smuggling of Live Animals: Illegal unregulated transboundary movement of susceptible livestock involving live animals is a major driver opening high risk pathways especially in regions having porous borders. This includes smuggling animals from infected regions to bypass/avoid mandatory veterinary ante- and post-mortem inspections and quarantine with a fear for export bans or to take

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advantage of higher market price in disease-free zones. Subdued or subtle symptoms of FMD in sheep and goats remain unnoticed by traders moving them across the borders in an illegitimate manner thereby spreading the virus.

2. High Prevalence of FMD: High prevalence of FMD in small or large ruminants in endemic regions makes them a significant risk factor for transboundary transmission. FMDV can survive in lymph nodes and bone marrow making raw meat a high-risk vehicle for the spread.

3. Illegal Transaction of Animal Products: Illegal importation of meat/meat products (such as bone-in beef) provides a route to avoid safety control paths. The virus enjoys ample stability and survives in meat derived from viremic animals. Major percentages of illegally imported products into Great Britain were FMDV contaminated with ~68% of the risk linked to bone-in and dried de-boned products. Illegally imported meats have been the cause for a number of pig diseases, *e.g.*, FMD, ASF, CSF, SVD and PRRS introduced into countries.

Drivers of illegal trade are: (i) market price disparity, where high demand for cheaper meat in FMD-free regions provokes smuggling from less price situation in endemic regions; (ii) long international porous borders stands as a challenge for the authorities to prevent the unusual animal movement; (iii) due to lack of legal outlets, producers in restricted zones opt for illegal shop counter for more benefit.

4. Illicit Disposal of Feed during International Travel: Disposal of feed or waste in illegal manner from foreign ships or airplanes visiting ports has been exemplified to have introduced the virus, as suspected in 1956 South African outbreak where contaminated waste was fed to the pigs.

5. Breach/ Compromise in Biosecurity and Quarantine Protocols: Deliberate negligence/ avoidance of quarantine procedures to reduce the high cost associated with trade restrictions and avoid inspection delays can help introducing diseased animals into a region. Lack of serological testing seen during illegal movements can enhance the risk of FMDV introduction by up to 19 times.

6. Mechanical Factors like Contaminated Equipment and Fomites: Illegal movement of contaminated farming equipments, footwear, vehicles or clothing from affected areas can carry and subsequently spread the virus.

7. Callousness with Improper Border Control and Lack of Surveillance: Porous borders and lack of strict vigilance as well as surveillance favor illicit shift of silently infected animals to a new region.

8. Incentivizing Illegal Activity as Economic Drivers: High-cost or prohibitive legal requirements as well as delays associated with legal testing and certification can encourage illegal trafficking as well as trade increasing the likelihood of pathogen introduction.

9. Major Source Areas: Shipments of products from regions where FMD is endemic, such as parts of Asia and the Middle East pose substantial risk.

10. Swill Feeding: Feeding meat scraps or swill to pig obtained through illegal imports is considered to be a primary pathway for outbreaks in free countries and infected pigs being the amplifier host exhale enormous quantum of infectious aerosol virus facilitating its spread.

Significant Historical Examples of FMDV Incursions

1. Greece (1994): The outbreaks in Greece in 1994 were traced back to illegal trade of sheep and goat from Turkey into Lesbos.

2. Taiwan (1997): An outbreak after 68 years of freedom in Taiwan was speculated to have originated from illegally imported meat products likely from mainland China through fishing boats.

3. Algeria (1999): The disease entered into Algeria through infected cattle smuggled from West Africa across the desert.

4. South Africa (2019, 2000, 2025-2026): An outbreak in pig farm was suspected to be caused by pig feed illegally received from a foreign ship. The PanAsia type O outbreak in South Africa in 2000 in pig farm was due to feeding of swill carried from ships (Kitching *et al.*, 2005). Recent outbreaks in South Africa have been linked to the movement of animals from neighboring countries of Zimbabwe facilitated by porous borders and broken veterinary cordon fences.

5. Great Britain (2001): Although the 2001 outbreak compelled a culling of over 6 million animals, assessments estimate that around 11,875 tonnes of illegal meat enter the country annually, posing a constant risk. The involvement of a swill-fed pig unit was reported in the spread of FMD during the 2001 type O outbreak in the UK (Paton *et al.*, 2009).

6. South Korea (2002) and *Japan* (2000): In type O FMD epidemic in South Korea in 2002, 15 of 16 outbreaks were detected in piggeries. Imported straw was pesumed to be the source of Korean FMD outbreak in 2000 (Shin *et al.*, 2003) that might also have been the source of the FMD outbreak in Japan during the year 2000.

7. Uzbekistan, Mongolia, Armenia, Georgia, Russia (2000), *Kyrgyzstan* (2001) and *Tajikistan* (2001-2003): The PanAsia O virus was detected in Uzbekistan, Mongolia, Armenia, Georgia and Russia and then in 2001 in Kyrgyzstan and during 2001-2003 in Tajikistan. The virus subsequently spread to South Africa in 2000. The outbreak was attributed to the swill feeding to pigs from a ship originated from Asia.

8. Uruguay: The type O outbreak in Uruguay near the Brazilian border was caused by the feeding of contraband slaughterhouse offal to pigs housed in close contact to cattle (Sutmoller *et al.*, 2003).

Impact of Introduction of FMD into a Disease-free Country and Strategy to Get Rid of

The illegal trade of animals and products or contaminated feed has facilitated the FMDV introduction with devastating economic impacts:

1. Massive Economic Loss: Outbreaks triggered through illegal imports in free zones can cost billions of dollars due to culling, lost trade and emergency control measures; for example, the 2001 UK outbreak linked to illegally imported meat caused approximately $10 billion damage.

2. Loss of Disease-free Status: Countries like South Africa and Germany have previously lost their 'FMD-free without

vaccination' status due to outbreaks, leading to immediate bans on live animal and meat exports.

3. Trade Restrictions: International bodies like the WOAH impose strict limitations on countries with active FMD outbreaks.

4. Market Cessation: A single case can even lead to the immediate closure of lucrative export markets as per rule for at least three months as seen in South Africa and Australia.

5. Response/Mitigation Strategy: Based on research outputs, facilitating legal trade with strict serological requirements may be more effective than full prohibition, as it reduces the economic incentive for illegal smuggling.

Conclusion

We should remember the theory of karma as a doctrine of Indian philosophy. Good karmas lead to good consequences and bad karmas lead to bad consequences. The essence of karma is 'as action is fruit' the fruit of one's deeds is never lost. If man gets involved in unlawful actions with bad intentions, then the outcome or consequence becomes dreadful. In the paper, we got an acquaintance with facts how trade in an illegal manner has been responsible for causation of FMD outbreaks in disease-free nations that has subsequently ensured a huge economic damage to the concerned nation. Hence, the biosecurity protocols in totality should never be underestimated during the trade as the invisible pathogen has the potential to ensure a visible impact.

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