



Epidemiological observations in carrion- mediated clusters of botulism in dairy cattle

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Botulism is a highly fatal neuromuscular disease affecting human and livestock all over the world (Martin 2003, Van der Burgt *et al.* 2007). Incidence of botulism scores highest public health importance as botulinum neurotoxin (BoNT) is a most potent bio-warfare agent. Upon ingestion of the exotoxin produced by *Clostridium botulinum*, animals undergo peripheral neuronal paralysis and die due to respiratory paralysis. Many of food-borne diseases were observed to follow a pattern of cluster outbreak (Sheth *et al.* 2008). From 2000 onwards, many cluster outbreaks of botulism in cattle were reported from western countries (Braun *et al.* 2005, Payne *et al.* 2011). There is scarcity of literature about confirmed reports of botulism in India (Tanwar *et al.* 2003, Kataria *et al.* 2009). The present study describes epidemiological characteristics of bovine botulism which occurred as clusters.

This study was carried out during January 2012–December 2013 in the Department of Veterinary Clinical Medicine, Ethics and Jurisprudence, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India. Dairy cows brought to the Teaching Veterinary Clinical Complex, Namakkal were included in the study. Besides, cases reported telephonically from neighboring districts were also included. Number of clusters and number of animals affected in each cluster were recorded in each incidence. Animal sheds and their surroundings, grazing area, fodder storage area and other management practices were observed. Clinical samples including serum, dung and rumen liquor were collected as per standard procedure. Rumen liquor, dung and soil samples collected from the farm premises were subjected to bacteriological culture.

In order to confirm botulism, dung, rumen liquor, culture supernatant and serum samples were subjected for mouse lethality test (Lindstrom and Korkeala 2006) after obtaining

due approval from Institute Animal Ethics Committee. Inoculum was prepared as described in the manual of Centre for Disease Control and Prevention, Atlanta, USA (CDC 1998). Development of ruffling of fur, labored abdominal breathing, weakness of limbs and total paralysis, appearance of ‘wasp-waist’ sign and death of mice within 96 hours post-injection confirmed the presence of botulinum neurotoxin (BoNT) in the suspected materials. Symptomatic treatment was given as described by Radostits *et al.* (2009) and the treatment response was recorded. Based on the recorded information, case fatality rate (CFR) was calculated.

Dairy cattle (74) were affected in 25 clusters. From each cluster, 2 to 4 animals were reported. Out of 74 cows, 57 (CFR: 71.03%) animals died in spite of treatment. Only 22.97% of the cows survived with the symptomatic therapy. Cases were reported from 6 districts Tamil Nadu (Namakkal, Trichy, Salem, Dharmapuri, Karur and Dindigul) located in the Latlong of 10–12°N and 78–79°E. Majority of the clusters (68%) were located in Namakkal district where intensive layer poultry production is on. The pattern of occurrence in botulism was almost typically a cluster outbreak as herd mates shared single point source of infection (Jones 1996). The *Clostridium botulinum* type C could be increasingly more widely distributed in the farming environment, particularly adjacent to intensive poultry production units (Smart *et al.* 1987). In one recovered cow, recurrence of botulism was observed. None of cluster had any incidence of botulism in buffaloes although buffaloes were reared in the same localities. But in three clusters, sheep and goats were also affected. Susceptibility of cattle is higher than that of carnivorous animals.

Among the breeds, Jersey cross (47.30%), Holstein-Friesian (25.68%), crossbred (25.68%) and non-descript cattle (1.35%) were affected. Highest frequency of incidence was recorded in the age group of 3 to 5 years. In two incidences, calves aged below 6 months were also affected. All affected animals were females. The incidence of botulism was observed in cattle at different physiological status. Botulism was observed in calves (2.70%), heifers (14.86%) and pregnant animals (25.68%). Major proportion

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of the affected cattle was in mid-lactation (41.89%). The course of illness ranged from 2 – 30 days. Age, breed and sex predisposition was not accurate because of skewed composition of the population.

In all clusters, semi-intensive system of rearing was followed in which feeding trough and feed materials were kept uncovered. Based on the epidemiological information collected in all incidences of botulism, 94.59% of animals were reared in close association with poultry layer farms. The affected animals were either reared inside the farm premises or housed in very close proximity (<100m) to the farms. In very few clusters (5.4%), direct association with poultry farms could not be established.

During the study, availability of decaying carcasses in the vicinity of animal sheds was observed in most of the clusters. *Clostridium botulinum* was isolated from bird carcasses which were thrown in the open area near the animal sheds. Botulism can occur as carrion-mediated (Radostits *et al.* 2009), due to ingestion of carcasses / broiler litter (Otter *et al.* 2006, Kennedy and Ball 2011, Payne *et al.* 2011) or silage contaminated with poultry litter including carcasses (Hogg *et al.* 1990). The occurrence of bovine botulism in clusters and the association with decaying carcasses are supported by the reports of the above authors. Many scavenging birds and other carrion-eaters can act as vectors and facilitate the spread of botulism in farms which do not have the previous history of botulism (Notermans *et al.* 1981). It is concluded that the semi-intensive system of rearing cattle, improper bird carcass disposal and carrion-scavenging animals were found to be the precipitating factors for botulism.

SUMMARY

Clusters of botulism were observed in dairy cattle which were reared in close proximity to poultry layer farms in the state of Tamil Nadu, India. The confirmatory diagnosis was made based on the mouse lethality test with the clinical and environmental material collected from the clusters. From 25 clusters, a total of 74 animals were affected. Case fatality rate was 71.03%. Age, sex and breed predisposition for botulism could not be arrived at. Out of 74 animals, 94.59% were reared in close proximity (< 100m) to poultry layer sheds. It was found that improper disposal of bird carcasses in vicinity of cattle sheds and semi-intensive system of rearing of cattle precipitated the occurrence of cluster outbreaks of carrion-mediated botulism in cattle.

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