SC/68A/E/13

Strandings of Costa Rica 2004 to 2019: from bacterial genetics to virtopsy to understand the main cause related

Gabriela Hernandez Mora, Jose David Palacios Alfaro, Rocio Gonzalez Barrientos

INTERNATIONAL WHALING COMMISSION

Strandings of Costa Rica 2004 to 2019: from bacterial genetics to virtopsy to understand the main cause related

Gabriela Hernández Mora[1*], José David Palacios Alfaro[2], Rocío González Barrientos[3].

[1]Bacteriology Area, Veterinary Diagnostic Department, National Service of Animal Health (SENASA), Minsitry of Agriculture and Livestock, Heredia, Costa Rica
[2]Keto Foundation PO Box 1735-1002, San José, Costa Rica
[3]Cornell University, Department of Biomedical Sciences; Section of Anatomic Pathology

*Corresponding author: gabbytica@gmail.com / mghernandez@senasa.go.cr

Abstract

The causes of mortality of cetaceans in Costa Rica began to be investigated in the year 2004 (1). Since then, at least 161 cetaceans have been reported as stranded, been striped dolphin (*Stenella coeruleoalba*) the most frequent species (46%) (2). These animals came ashore and stranded alive with problems of coordination, buoyancy and swimming and die within few hours after the event, despite the reintroduction of these in their environment by residents or tourists in the area. *Brucella ceti* has been consistently isolated from the central nervous system of these dolphins associated with the presence of inflammation of the meninges and other structures of the Central Nervous System (meningoencephalomyelitis) that compromise the survival of these animals (3). Also, during these 15 years, 3 pregnant females (two striped dolphin and one *Kogia sima*) were studied for brucellosis and *B ceti* was isolating causing inflammation and destruction of the placenta. The bacteria was isolated from milk, fetal fluids and organs as well as reproductive tissues and spleen, lymph node and hearth valves causing endocharditis (2-3)

In total, in the Pacific shores of Costa Rica, another 4 species have been described as serologically positive for brucellosis, including bottlenose dolphin, (*Tursiop truncatus*), spotted dolphin (*S. attenuata*) rought tooth dolphin (*Steno bredanensis*) and cuvier beak whale (*Ziphius cuvier*). In addition to the aforementioned species with isolation (striped dolphin and dwarf sperm whale), *B. ceti* was successfully recovered also in a common dolphin (*Delphinus delphis*).

Using whole genome sequencing analysis of these bacteria potentially transmissible to humans, it has been identified that for the Eastern Tropical Pacific (ETP) first: all these cetacean species from 3 different families (Delphinidae, Ziphidae, Physeteridae) are susceptible to this infection and conservational initiatives should consider these and other disease that affects reproduction and cause mortalities that are not currently investigated in the ETP and second: all these isolation represent a unique bacterial group different from other latitudes where these bacteria has also been isolated in stranded cetaceans such as the Atlantic or Mediterranean Sea (4).

During 2017 and 2018, the use of computerized axial tomography in collaboration overseas with the School of Medical and Health Sciences of Hong Kong has allowed to describe the clinical

presentation of these cases prior to performing the necropsy (virtopsy), which represents a opportunity to describe by imaging in stranded cetaceans and that allows to transpolar this information into human medicine infections in cases of neurobrucellosis in countries were brucellosis in terrestrial animal are endemic.

Finally, due to the high incidence of this bacterial disease in stranded animals in the Costa Rican shores, biosafety measures should be established each time when handling stranded cetaceans in the region according to One Health concept (5).

Literatured Cited

1. Hernández- Mora G, González-Barrientos R, Morales JA, Chaves- Olarte E, Guzmán-Verri C, Baquero-Calvo E, De-Miguel MJ, Marín CM, Blasco JM, Moreno E. Neurobrucellosis in stranded dolphins, Costa Rica. Emerg. Infect. Diseas. 14 (9): 1429- 1433.

2. Hernández-Mora G, Bonilla-Montoya R, Barrantes- Granados O, Esquivel-Suárez A, Montero-Caballero D, González-Barrientos R, Fallas-Monge Z, Palacios-Alfaro J D, Baldi M, Campos E, et al. 2017. Brucellosis in mammals of Costa Rica: an epidemiological survey. *PLoS ONE*, *12*(8), e0182644. http://doi.org/10.1371/journal.pone.0182644

3. González-Barrientos R, Morales JA, Hernández-Mora G, Guzmán Verri C, Chaves Olarte E, Moreno E. 2010. Pathology of Striped Dolphins (*Stenella coeruleoalba*) Infected with Brucella ceti. J Comp Pathol. 142(4):347-52.

4. Suárez-Esquivel M, Baker KS, Ruiz- Villalobos N, Hernández Mora G, Barquero-Calvo E, González-Barrientos R, Castillos Zeledón A, Jiménez Rojas C, Chacón-Díaz C, Cloeckaert A, et al. 2017 *Brucella* genetic variability in wildlife marine mammals populations relates to host preference and ocean distribution. Genome Biol. Evol. 1901–1912 doi:10.1093/gbe/evx137

5. Hernández-Mora G., J.D. Palacios-Alfaro & R. González-Barrientos. Other wildlife reservoirs: Brucella in aquatic environments. Rev. sci. tech. Off. int. Epiz (OIE). 2013, 32 (1), 89-103.