

Twenty Years Later: A New Case Of Endolymphatic Tube Infection, Internal Otitis And Meningitis Caused By *Fusarium solani* In A Port Jackson Shark (*Heterodontus portusjacksoni*)

Nuno Pereira,^{1*} Ricardo Faustino,^{2,3,4} Pedro Faísca,^{5,6} Cristina Veríssimo,⁷ Hugo David,⁸ and Núria Baylina,¹

¹Oceanário de Lisboa, Lisboa, 1990-005, Portugal; ²Instituto de Biofísica e Engenharia Biomédica, Faculdade de Ciências da Universidade de Lisboa, Lisboa, 1749-016, Portugal; ³Escola Superior de Saúde Ribeiro Sanches, Lisboa, 1950-396, Portugal; ⁴Faculdade de Medicina, Universidade de Coimbra, Coimbra, 3004-504, Portugal; ⁵Faculdade de Medicina Veterinária, Universidade Lusófona de Humanidades e Tecnologias, Lisboa, 1749-024, Portugal; ⁶DNatech, Lisboa, 1649-038, Portugal; ⁷Instituto de Saúde Dr. Ricardo Jorge, Department of Micology, Lisboa, 1649-016, Portugal; ⁸Vet Planet, Coima, 2830-411, Portugal

Abstract

Fusarium solani infections in elasmobranchs are described mainly with skin, lateral line, skeletal muscle, and cartilage involvement.^{1,2,3} We described *F. solani* cases with head subcutaneous abscess of the endolymphatic tubes, labyrinthitis and meningitis in 4 Port Jackson sharks, occurring *c.* twenty years ago. Last year, we had a new case with a similar clinical and histopathology presentation.

In October 2017, a 2 year old captive bred Port Jackson shark (*Heterodontus portusjacksoni*) male showed a 2 week long anorexia, intermittent circular and spiral swimming accentuated to the left side. A dorsal subcutaneous head nodule was visible. He started treatment with terbinafine (20mg/kg PO SID and 10 days later raised to 40mg/kg) and ceftazidime (30 mg/kg IM q 72 h). The nodule was aspirated, and *Fusarium* sp. was isolated. Three weeks later, the aforementioned signs remained, the left eye presented a hypertrophied and congested bulbar conjunctiva and the head nodule fistulized. He was medicated with meloxicam (5 mg/kg IM q 48 h). Despite several head nodule aspirations and the described treatment, clinical signs didn't improved and the animal was euthanized due to humane considerations. Throughout the treatment, complementary examinations were performed, such as ultrasound, aspiration of pus from the head nodule and collection of blood for hematological analysis. Soon after death a computerized tomography and an MRI were performed.

The CT scan showed an exophthalmia in the left eye with an intact endocranium. The MRI allowed to observe a greater contrast in the soft tissues through T1 images and to visualize an edema in T2 and more significantly in 3D-CISS with enhancement of the anatomical structures that surround the left eye cavity. The left labyrinth suffered major changes due to loss of lymph (and consequently MR signal), compared with the contralateral structure. The 3D-CISS allowed the identification of the presence of a fistula connecting the lesion located at the top of the animal's head towards the left eye, thus demonstrating a pathway of probable infection. The FLAIR image showed a more intense MRI signal in the left labyrinth than the right one (no signal), probably due to the high protein content in the labyrinth and surrounding tissues (infection).

The necropsy confirmed macroscopically the presence of the head abscess. Histologically, a panniculitis, conjunctivitis, labyrinthitis and meningitis were observed, all with a diffuse, severe, heterophilic and lymphohistiocytic infiltrate, with mycotic contamination of the labyrinth cartilage. Two bacteria were isolated, *Citrobacter braaki* from the abscess during the treatment and *Stenotrophomas maltophilia* at the necropsy from brain cavity aspirations. Collected samples from an aseptic aspiration of the abscess and the brain cavity were cultured

on Sabourad dextrose agar and incubated at 27°C for 7 days. The morphological features were compatible with *Fusarium solani* (complex).

The similarity of these cases separated with c. 20 years allows us to propose this disease as a clinical and pathological entity in Port Jackson sharks. Furthermore, we emphasize the diagnostic value of MRI and the remaining difficulty in the clinical handling of mild to severe *F. solani* infections in sharks.

Acknowledgements

The authors wish to thank the staff at Oceanário de Lisboa for the work and dedication which made this study possible. The authors also thank the Clínica S24 - Centro de Diagnóstico team for the logistical support.

Literature Cited

1. Stidworthy, M.F. Thornton, S.M. and James, R. 2017. A review of pathologic findings in elasmobranchs: a retrospective case series. In: Smith, M. & Warmolts, D. & Thoney, D. & Hueter, R. & Murray, M. & Ezurra, J. (Editors) 2017. The Elasmobranch Husbandry Manual II: Recent Advances in the Care of Sharks, Rays and their Relatives. Special Publication of the Ohio Biological Survey. p 277-288
2. Dove, A.D.M. Clauss, T.M.D. Marancik, P. and Camus, A.C. 2017. Emerging diseases of elasmobranchs in aquaria. In: Smith, M. & Warmolts, D. & Thoney, D. & Hueter, R. & Murray, M. & Ezurra, J. (Editors) 2017. The Elasmobranch Husbandry Manual II: Recent Advances in the Care of Sharks, Rays and their Relatives. Special Publication of the Ohio Biological Survey. p 263- 277
3. Fernando N, Hui S-W, Tsang C-C, Leung S-Y, Ngan AHY, Leung RWW, Groff JM, Lau SKP and Woo PCY. 2015. Fatal *Fusarium solani* species complex infections in elasmobranchs: the first case report for black spotted stingray (*Taeniura melanopsila*) and a literature review. *Mycoses* 58:422–431.
4. Pereira N, Nunes GD, Baylina N, Peleteiro MC, Rosado L. 2002. *Fusarium solani* infection in the eye, brain, otic capsule and endolymphatic tubes in captive Port Jackson sharks (*Heterodontus portusjacksoni*). IAAAM 33rd Annual Conference, Albufeira, Portugal. Pp. 54-56.