

SHORT COMMUNICATION

Cutaneous neoplasm in *Phaetobanus litigiosus* (Diptera, Tabanidae) collected on the Marambaia Island, Rio de Janeiro, Brazil

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Accepted January 28, 2016

Abstract

A female specimen of *Phaetobanus litigiosus* (Diptera: Tabanidae) collected on Marambaia Island was found with a tumor in the abdominal integument. Histopathological examination revealed an epithelial dysplasia with anisokariosis and hyperchromasia. This is the first record of a neoplasm found in tabanid collected from natural environment.

Key Words: Atlantic island; displasia; horse fly; insect disease; insect vector; neotropical region

Introduction

The family Tabanidae comprises approximately 4,300 species distributed throughout the world. The tabanids are mechanical and biological vectors of many pathogens to humans and domestic and wild animals (Foil 1989; Turcatel *et al.*, 2007). Several biotic and abiotic factors determine the behavior of tabanid populations by varying the number of individuals according to different landscapes and over years and seasons (Guimarães, 2015).

Interactive biotic factors are viruses, bacteria, fungi, helminths, other arthropods, fish, reptiles, amphibians and birds, which result in predation or parasitism. Some of these factors or other intrinsic factors cause pathologies that can lead to mutations, birth defects, metabolic disorders and malignancies that affect, in some degree, the survival of individuals or populations (Philip, 1965; Nayar, 1977; Savini and Furth, 2004; Asiain and Márquez, 2009; Ferreira, 2008, 2014).

Neoplasm in insects has been described from various causes, such as genetic factors, viruses infections, exposure to insecticides and experimental nerve severance. Melanotic tumors are reported in *Drosophila melanogaster* (Diptera: Drosophilidae) linked to genetic factors and viral

infections (Taylor, 1969). Insecticides can lead to tumor formation in *Musca domestica* (Diptera: Muscidae) (Cantwell *et al.*, 1966). Recurrent nerve severance induce formation of tumors in digestive tract of cockroach *Leucophaea maderae* (Blattodea: Blaberidae) (Matz and Bergoin, 1984).

The literature records no pathology related to cancer or tumors in tabanids. This study is related to a cutaneous tumor formation found in *Phaetobanus litigiosus* collected on Marambaia Island, Rio de Janeiro state, Brazil.

Materials and Methods

During October, November and December 2013 tabanids attracted by equine bait (*Equus caballus*) were collected through insect net, on Marambaia Island, municipality of Mangaratiba, Rio de Janeiro state, at location known as Vacaria Velha (23°03'47" S and 43°59'16" W). This site is close to secondary tropical forest and a swamp with a small pasture area where a tied equine spent the day; these collections were made from the morning twilight and all day until around 20:00 h, at least one day in each of the three months. For collection and transportation of biological samples the Instituto Brasileiro Chico Mendes de Biodiversidade do Ministério do Meio Ambiente issued permit nº 33382-1, SISBIO-IBAMA.

The collected tabanid specimens were examined and identified according to literature (Barretto 1950; Coscarón and Papavero 2009a);

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some specimens were mounted on entomological pins and other specimens were preserved in alcohol 70°; in one of these specimens a cutaneous injury was found on frontal side of abdomen. The specimen was examined under stereomicroscope Leica MZ 16 and the injury was photographed with Leica DFC 420 camera, at the Entomology Laboratory of Museu Nacional de História Natural do Rio de Janeiro. The injury was excised, fixed in buffered formalin and sent to the Laboratório da Seção Integrada de Tecnologia em Citopatologia do Instituto Nacional do Câncer - SITEC/INCA. The fixed material was prepared in histological sections stained with hematoxylin and eosin. The tabanid specimen and the blade with the histological sections are deposited in the Entomological Collection of Centro de Educação e Pesquisas em Medicina Ambiental - CEMA.

Results

P. litigiosus occurs in Brazil, in Minas Gerais, Rio de Janeiro, Sao Paulo and Parana states. During the three months of collection Vacaria Velha, Marambaia Island, 85 specimens were collected.

Material examined: *P. litigiosus*, Brazil, Rio de Janeiro, Mangaratiba, Marambaia Island, Vacaria Velha [23°03'47 "S and 43°59'16" O], 4-5.xii.2013, Guimarães Jr. leg., Guimarães det., (1 ♂ CEMA).

The observed injury was located between the first and the second left abdominal tergite (Fig. 1) about 0.5 mm in diameter. The injury showed rough and hardened surface. Histopathologic examination showed a cavity formed by a simple squamous epithelium, with an area of abnormal multiplication of integumentary cells; abnormal cells presented increased size nucleus and little cytoplasm (anisokariosis). Increased size nucleus presented granular coarsely chromatin (hyperchromasia), and evident nucleolus. There was no evidence of invasion of underlying corium or mitotic figures (Fig. 2).

Discussion

Neoplastic formations in insects are rarely reported in the literature: the insects are highly resistant to carcinogenesis, as most adult cells are post-mitotic, unable to multiply. However, during the larval stages, the stem cells present in the imaginal discs may change that result in neoplastic formations. Kirby and Spence (1826) refer to external wounds as precursors of tumors in insects, which does not seem to be the case of examined specimen, because any other anatomical changes on outer surface was observed. As to integument tissue formations for the account of Balazuc (1948) the meeting of a specimen of *Phytodecta variabilis* (Coleoptera: Chrysomelidae) presenting a large tumor formation in prothorax without histopathology.

White (1929) found similar structure to fibroma, originated from connective tissue in the thorax of a honeybee (*Apis mellifera* (Hymenoptera: Apidae). A brain tumor, presumably formed by glial cells, was found in worker of *Formica pratensis* (Hymenoptera: Formicidae) without differential diagnosis of abscess (Brun, 1925). Palm (1948) described a tumor formation in 'corpus allatum' of a male nymph of a species of *Gryllotalpa* (Orthoptera: Gryllotalpidae); the tumor showed giant cells formed from the cytoplasmic and nuclear fusion of smaller cells with kariorrhesis, indistinct nuclear membrane with numerous beads of chromatin and dispersed core remains in the cytoplasm. A tumor in pharyngeal gland was described in a species of the genus *Bombus* (Hymenoptera: Apidae): the affected gland showed a compact structure, displaced, enlarged, with abundant connective tissue, with no connection to the common duct, with numerous secretory ducts ending blindly. The cells showed signs of hypersecretion, degeneration and kariorrhesis (Palm, 1949). Salivary gland tumor were also observed in *Periplaneta americana* (Blattaria: Blattidae) when the ducts were tied or removed (Sutherland, 1963, 1967).



Fig. 1 Cutaneous injury in *Phaeotabanus litigiosus* collected on Marambaia Island, Mangaratiba, Rio de Janeiro, Brazil. The black bar measures 1 mm. Photo obtained at Entomology Laboratory of Museu Nacional de História Natural do Rio de Janeiro.

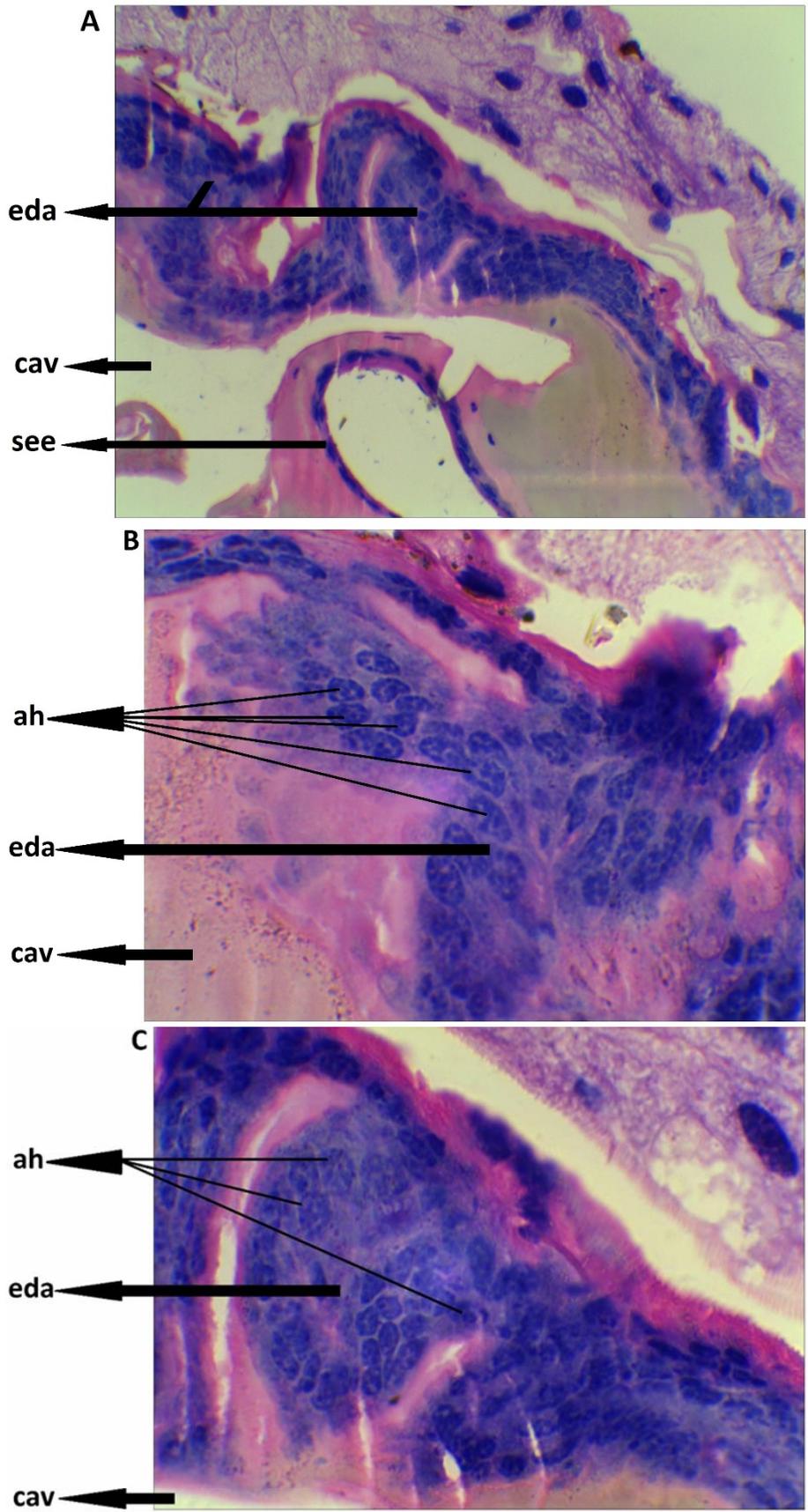


Fig. 2 Histopathological aspects of tumor found in *Phaeotabanus litigosus* collected on Marambaia Island, Mangaratiba, Rio de Janeiro, Brazil; A) Cavity (cav) formed by a simple squamous epithelium (see) and epithelial displasia area (eda) (400x); B and C) Cavity (cav) and an epithelial dysplasia area (eda) with anisokariosis, hyperchromasia, coarsely granular chromatin, evident nucleolus, and little cytoplasm (ah) (1000x).

Among the invertebrates *D. melanogaster* is considered to be the most susceptible species to cancerous tumors, subject to tumors determined by variations in temperature, exposure to X-rays or by chromosomal inheritance and most carcinogenesis records on insects is made in *D. melanogaster* (Wautier and Wautier, 1952; Slade, 2012). Melanotic hereditary tumors in larvae of *D. melanogaster tumor^w* strain involve encapsulation of caudal lipid bodies by hemocytes and hematopoietic organs. These hematopoietic bodies put in service a large number of blood cells, which originate lamelocytes and plasmatocytes which synthesize endogenous tissues (Perotti and Bairati, 1968; Rizki and Rizki 1974; Nappi *et al.*, 1984; Silvers and Hanratty 1984; William and Hanratty 1984). The melanotic encapsulation performed by melanocytes is a characteristic response against aberrant tissues in *Drosophila* and other insects (Tascetta and Ottaviani, 2014). The Tumorous-lethal mutation (*Tum-l*) is temperature-dependent and also leads to excessive proliferation of hemocytes and the formation of neoplastic melanotic tumors in the larval hematopoietic bodies (Luo *et al.*, 1993).

Rous sarcoma virus determines chromosomal abnormalities, and tumor formation in *D. melanogaster* that did not seem to be a really neoplastic formation, as it is known in mammals (Burdette and Yoon, 1967; Kirk *et al.*, 1970). The polyhedrosis virus occurs naturally in *Gilpinia hercyniae* (Hymenoptera: Diprionidae) and determines proliferation of the germ cells forming a tumor that surrounds the external surface of the digestive tract (Bird, 1948). Abnormal proliferation of epidermal cells larvae of *Hyphantria cunea* moth (Lepidoptera: erebidae) is also caused by the nuclear polyhedrosis virus and determines polyhedral formations in hypertrophied nuclei, which differs from the changes found in classical neoplasms (Watanabe, 1968).

Tumors in the digestive tract caused by experimental severance of recurrent nerve in *L. maderae* are formed by proliferation of epithelial cells and hemocytes encapsulated by granulocytes; some authors point inflammatory processes determined by microorganisms in the digestive tract is the cause of the alteration (Scharrer, 1945a, b, 1948, 1949a, b; Matz, 1965; Taylor, 1969; Matz and Bergoin, 1984) The fact that these tumors may be transplanted and proliferate in other individuals from filtered cell or insect DNA with recurrent nerve damage, although not present tumors, indicating a likely viral etiology (Matz and Bergoin, 1984).

The fluorenone derivatives induce the formation of tumor injuries in the hypodermis, intestine and lipid bodies in *M. domestica* (Cantwell *et al.*, 1966).

In literature, only *D. melanogaster* is recorded as susceptible to true tumors. Thus, the cutaneous neoplasm record in adult Tabanidae, collected in nature, is unique true record of cancer in other species of Diptera. The histopathologic diagnosis differs from any other recorded in similar injuries related to other insects. The used methodology did not allow the study of the cause of injury.

Acknowledgements

The authors thank Dr. M Couri, Museu Nacional

de História Natural do Rio de Janeiro, for tabanid specimen photography. The authors also thank Escola Nacional de Saúde Pública Sérgio Arouca - ENSP-FIOCRUZ for financial support and CAPES (Fellowship process nº 1383383).

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