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## Morphological and genetic demonstration of *Cephalopina titillator* in dromedary camels

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## ABSTRACT

**Background:** Cephalopina titillator is one of the most important parasites, which infests the upper respiratory tract of camels leading to deteriorating health effects, substantial economic losses, and even death.

Aim: This study aimed to detect the prevalence rate of *C. titillator* in slaughtered camels, determining its morphology using the electron microscope, and confirming its species by molecular phylogeny.

**Methods:** A total of 200 slaughtered camels at different areas in Al Muthanna province (Iraq) were inspected visually to collect the parasite samples that were identified initially based on their morphological characteristics. To confirm the parasite species, molecular phylogeny was conducted targeting the COX1 gene.

**Results:** An overall 19.5% of study camels were found infested with *C. titilator*. Based on light and electron microscopes, the larval stage of *C. titilator* was shown numerous posterior spiracular pores, cephalo-pharyngeal skeleton, abdominal segments, spinulation in anterior ventral portion, no spines on the final segment of abdomen, and rounded dorsal surface. Dorsoventrally, a slender and flattened shape with the presence of 12 segments as well as widely separated antennal lobes and obligate mouth hooks were seen. Molecularly, all the tested samples were found positive by polymerase chain reaction (PCR). Additionally, some positive PCR products were sequenced, and reported in the NCBI-GenBank under the access numbers OP218846, OP218847, and OP218845, OP218849, OP218842, OP218843, and OP218844. Sequence analysis revealed the obvious identity between the local isolates and the global NCBI-GenBank Iran isolate (MW136151.1).

**Conclusion:** This study described precisely the morphology of *C. titillator* using the light and electron microscopes suggesting its role in appropriate identification and classification. Molecular examination demonstrated the importance of COX1 gene in the identification of *C. titillator* and sequencing of the local isolates; however, additional molecular phylogenetic studies are needed to establish the evolutionary relationships among the oestrid group of insects with specialized habits and habitats.

**Keywords:** Nsopharyngeal myiasis, Cytochrome C oxidase subunit 1, *Camelus dromedarius*, Electron microscopy, Polymerase chain reaction, Sequence.

## Introduction

In Iraq, dromedary camels (*Camelus dromedarius*) are a vital domestic animal species that plays an important role as the primary source of milk and meat in many areas (Al-Graibawi *et al.*, 2021). Although, camels best adapted to harsh environments and fluctuating nutritional conditions of semi-arid and arid areas, infectious bacterial, parasitic, and viral diseases appear to be the major health problems that are potentially hampering the performance of camels (Al-Abedi *et al.*, 2020; Al-Bayati *et al.*, 2023; Al-Taee *et al.*, 2023). *Cephalopina titillator*, (Clark, 1797) belongs to the Oestridae Family in the Diptera Order of Insecta Class, and is an obligate parasite of camelids only (Yao *et al.*, 2022). Directly at the nostrils of camels, the female ostrid fly deposits the first larval instars that crawl up to the nasopharynx and paranasal sinuses and remain attached to the mucous membrane for approximately 11 months, throughout, they moult twice (Yousef *et al.*, 2016; Hassan *et al.*, 2022). Hence, the infested camels mostly suffer from head shaking and anxiety, loss of appetite, and decreased in milk production in addition to respiratory distress that is characterized by nasal discharge, labored breathing, recurrent

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