Mini Review

iMedPub Journals
www.imedpub.com

Advanced Techniques in Clinical Microbiology

2021
Vol.3 No.3:114

Host and Microbial Symbiont Dynamics are influenced by Insect–Microbiome Interaction Dynamics

Sayıner Arzu*

Department of Medical Microbiology, Medical Faculty, Dokuz Eylul University, Izmir, Turkey

Received: December 07, 2021, **Accepted:** December 21, 2021, **Published:** December 28, 2021

***Corresponding author:**
Sayıner Arzu

sayiner@arzu.tu.com

Department of Medical Microbiology, Medical Faculty, Dokuz Eylul University, Izmir, Turkey

Citation: Arzu S (2021) Host and Microbial Symbiont Dynamics are influenced by Insect–Microbiome Interaction Dynamics. Vol.3 No.3:114

Introduction

Insects have a close contact with their gut microbiota, and this symbiotic relationship has evolved into an important evolutionary consequence aimed at ensuring their survival in harsh environments. While it is well recognized that insects, with a few exceptions, connect with a variety of microorganisms over their life cycle, knowledge on several features of these partnerships is still lacking. The acquisition of bacteria by insects initiates microbial symbiosis, which is followed by the adaption of these bacterial species to the intestinal environment for long-term survival and generational transmission. Although various insect–microbiome interactions have been discovered, each with its own unique characteristics, diversifications, and specializations, it is still unknown what caused these diversifications. Various evolutionary processes acting within an insect body have been implicated in the shift of a free-living microorganism to an obligatory or facultative symbiont, eventually leading to the creation and diversity of these symbiotic associations, according to recent studies.

Insects are one of the most diverse and ancient forms of life on Earth and their population level can inflict significant devastation if it crosses a certain threshold. Their existence may be traced back to the Paleozoic epoch, when Orthopterans and Hemipterans first arrived on the planet. They've progressed since then and have successfully endured a variety of harsh environmental situations. Despite the fact that insects are both ecologically and economically significant, insect pests, which are mostly a result of man-made habitats and many of them are a result of climate change, are responsible for more than 20% of crop destruction each year. Furthermore, changing climatic circumstances have an impact on insect migration patterns, life cycle timing, and population dynamics. While overcoming these obstacles, they were able to increase their host range, change their behavior and biology, and invade and colonise many agro-climatic zones around the planet. Because of their vast population size, short reproductive cycles, and high reproducing rates, they have been able to successfully withstand all adversities [1] they have colonised many regions of the world due to their little body weight, which allows them to be transported away by wind currents, and they now inhabit practically all of the planet's ecosystems. Furthermore, their complex connection with beneficial bacteria has been critical to their diversification and evolutionary success. Throughout their evolutionary history, insects have been recognized to be connected with microorganisms such as bacteria and fungi [2].

Some bacterial species live in specialized cells called bactericides within insects and are referred to as 'endosymbionts,' while others live on the body surface and are referred to as 'ectosymbionts.' They are mostly found in the digestive tract, where they operate as major modulators of their insect hosts' various lives (both in terms of nutrition and ecological niches. The gut microflora of an insect is known to facilitate its feeding even on recalcitrant food, provide immunity and protection against various predators, pathogens, and parasites, compensate for a nutrient-poor diet (e.g., in the case of sap-sucking insects, mediate inter- and intra-specific communication, control mating and reproductive success, aid digestion and supply essential amino acids- metabolic compounds- Symbionts major duty, according to research, is critical food delivery, followed by digestion and detoxification. As a result, it implies that insects' survival and proper life cycle transactions are significantly reliant on their gut microbiota. Their relationship can also be categorized as obligate (or primary) or facultative, depending on the degree of dependency (or secondary) [3].

However, there is no clear distinction between the two categories because facultative bacteria can become obligate under certain conditions. Some researchers refer to these symbionts as "intracellular parasites" that have taken over the insect body and evolved a variety of methods to secure their existence while benefiting their host. It's also possible that the insect formed this interaction with its microbiota in order to survive. Whatever the situation may be, they have now adapted to each other. Bacterial species found in the guts of insects can be mutualistic, commensal, or even harmful [4].

Previous research has uncovered systems involved in endosymbiont acquisition, maintenance, and transfer. However, we know very little about the mechanisms that drive this entire shift, i.e., the transformation of a free-living bacterium into an obligate symbiont that lives inside an insect. Surprisingly, the bacterial genome is known to change in order to adapt to the intestinal environment. It not only changes itself, but certain microorganisms can even manipulate their insect host to ensure their survival. The insect host is known to play a significant influence in forming the microbiome of the insect, and these endosymbiotic bacteria have now become so integrated into the insect's body.

References

1. Arbuthnott D, Levin TC, Promislow D (2016) The impacts of Wolbachia and the microbiome on mate choice in Drosophila melanogaster. J Evol Biol 29: 461-68.
2. Baumann P (2005) Biology of bacteriocyte-associated endosymbionts of plant sap-sucking insects. Annu Rev Microbiol 59: 155-89.
3. Behar A, McCormick LJ, Perlman SJ (2010) Rickettsia felis infection in a common household insect pest, Liposcelis bostrychophila (Psocoptera: Liposcelidae). Appl Environ Microbiol 76: 2280-85.
4. Belda E, Moya A, BentleyS, Silva FJ (2010) Mobile genetic element proliferation and gene inactivation impact over the genome structure and metabolic capabilities of Sodalis glossinidius, the secondary endosymbiont of tsetse flies. BMC Genomics 11: 449.