UKRAINIAN JOURNAL OF VETERINARY SCIENCES

2024. Volume 15, No. 2. P. 157-169

Received: 28.01.2024 Revised: 13.04.2024 Accepted: 29.05.2024

DOI: 10.31548/veterinary2.2024.157

UDC 636.32/.38.09:616-071

The role of zoophilic flies *Hermetia illucens* (Diptera: Stratiomyidae) in the spread of myiasis in mammals

Serhii Melnychuk*
Doctor of Biological Sciences, Professor
National Academy of Agrarian Sciences of Ukraine
01010, 9 Mikhail Omelyanovich-Pavlenko Str., Kyiv, Ukraine
https://orcid.org/0009-0006-6583-3128

Andrew Dubovyi
PhD in Medical Sciences
The University of Auckland
1023, 85 Park Road, Auckland, New Zealand
https://orcid.org/0000-0003-1978-9163

Nataliia Soroka
Doctor of Veterinary Sciences, Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0003-4659-6666

Serhii Honcharov
Doctor of Veterinary Sciences, Associated Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0001-7464-6689

Abstract. The relevance of investigating the distribution, biology, and role of zoophilic flies *Hermetia illucens* of the family *Stratiomyidae* in the occurrence of myiasis in mammals lies in the ability of these flies to parasitise animals, which poses a threat to their health and life. The purpose of this review was to analyse scientific research on the possible spread of *Hermetia illucens* flies as a potential pathogen of parasitic diseases in Ukraine. The study employed the methods of analysis, comparison, and synthesis of scientific sources. It was found that the natural habitat of these flies is the countries of South and North America with tropical and subtropical climates. However,

Suggested Citation:
Melnychuk, S., Dubovyi, A., Soroka, N., & Honcharov, S. (2024). The role of zoophilic flies *Hermetia illucens* (Diptera: Stratiomyidae) in the spread of myiasis in mammals. *Ukrainian Journal of Veterinary Sciences*, 15(2), 157-169. doi: 10.31548/veterinary2.2024.157.

**Corresponding author*

these flies are also found in European countries, namely: Portugal, Spain, Malta, France, Albania, Croatia, Slovenia, and Switzerland. To intensify biotechnology in the agricultural sector, the larvae of *Hermetia illucens* flies are used as an ecological utiliser of organic agricultural residues. It is believed that the main reason for the emergence of *Hermetia illucens* flies in Europe is their importation into seaports and subsequent introduction into coastal areas. Considering the above, it is possible that *Hermetia illucens* flies may also appear in Ukraine (in the southwestern regions). Cases of larval parasitism of these flies in mammals have been established. They were mostly detected as parasites in the gastrointestinal tract. Their ability to cause typical enteric myiasis has been confirmed. Larval parasitism is non-specific: diarrhoea (faeces with blood and mucus), flatulence, vomiting, loss of consciousness, etc. The larvae can also parasitise under the skin, forming boils. A frequent cause of human infestation is the consumption of unwashed, overripe fruit and vegetables on which these flies lay their eggs. The results of the review can be used to develop methods for controlling the spread and reproduction of *Hermetia illucens* flies, as a species whose larvae are capable of parasitising mammals

Keywords: entomoses; saprophytic insects; larvae; facultative parasite; hermetiosis

Introduction

Even though flies are generally considered pests and spread infectious and parasitic diseases, they are important in providing alternative sources of protein. Specifically, the *Hermetia illucens* Linnaeus, 1758 or the *black soldier fly* has significant potential for large-scale production of various biotechnological products through the processing of organic waste. According to M. Zamri *et al*. (2023), this is because insects are a source of complete protein, vitamins, and amino acids. At the same time, growing insects on an industrial scale has many significant benefits, such as reducing greenhouse gas emissions and providing more sustainable economic opportunities. Researchers have noted the use of *H. illucens* pupae for feeding cattle, pigs, and fish, and the fat from these larvae is used to produce biodiesel (Kannan *et al*., 2023). The use of an alternative protein obtained from *H. illucens* flies has a positive effect on the growth rate of fish raised in aquaculture, as well as on the biochemical parameters of blood serum and the microbiological composition of the gastrointestinal tract of fish (Busti *et al*., 2024). In the current conditions of livestock intensification, this species of fly is of great interest because it is an excellent "utiliser" of organic waste, a producer of high-quality protein for animal feeding and chitin and chitosan for the pharmaceutical industry. Components derived from *H. illucens* also demonstrated a prominent level of growth inhibition for all mycelia studied – *Alternaria solani*, *Botrytis cinerea*, *Fusarium oxysporum*, *Pythium capsici*, *Sclerotinia sclerotiorum* (Kaczor *et al*., 2023). According to A. Makarynska *et al*. (2022), the current popularity of using *H. illucens* flies at different stages of development in modern biotechnology is considered to be safer for the environment and can make a substantial contribution to climate protection.

H. illucens belongs to the order *Diptera*, family *Stratiomyidae*, suborder *Brachycera Ortorrhapha*, infrasuborder *Stratiomyomorpha*. This species of fly is common in North and South America. *H. illucens* flies have been reported to be widespread worldwide, specifically in countries and regions with tropical, subtropical, and temperate climates (Kaczor *et al*., 2023). At the same time, A. Amir *et al*. (2020) reported the possibility of larval stages of *H. illucens* to

parasitise the gastrointestinal tract of animals and humans and cause enteric myiasis or hermatitis. Furthermore, it is noted that the incidence of mammalian enteric myiasis caused by *H. illucens* larvae is widespread in regions with a low level of socio-economic development. This is primarily due to the feeding of spoiled and rotten fruit or vegetables to animals, on which flies lay their eggs beforehand.

The purpose of this review was to analyse the special scientific literature on the role of zoophilic flies *H. illucens* in the spread of myiasis in animals and humans and their biology, as well as the risks of these flies in Ukraine as a potential facultative parasite.

The study was based on the methods of analysis, comparison, and systematisation of scientific literature and the findings of other studies. The scientific literature was analysed regarding the role of flies of the genus *Hermetia*, namely *Hermetia illucens*, in the spread of myiasis in mammals. This analysis provided information on known cases of myiasis caused by zoophilic flies, including their geographical distribution, mammalian host species, characteristics of the fly parasitoid stages, and impact on host health. Next, the results of different studies on the role of *Hermetia illucens* in the spread of myiasis were compared to identify similarities and differences in the data. This approach helped to identify general patterns and specific features in the impact of zoophilic flies on mammalian health and welfare. The main part of the study was to systematise the collected information to create a comprehensive understanding of the role of *Hermetia illucens* in the spread of myiasis in mammals. Notably, the current studies cover exclusively the issues related to the use of zoophilic flies *H. illucens* for biotechnological purposes. This includes domestic research by Ukrainian scientists on the use of flies for feeding vertebrates and aquatic life. At the same time, a considerable number of reports on *H. illucens* parasitism in animals and humans date back to the second half of the 20th century. This fact is apparently related not so much to the decrease in cases of *H. illucens* parasitisation of flies as to the lack of methods for diagnosing hermatitis in mammals, which makes the topic extremely relevant.

Features of biology and morphology of zoophilic flies of the family *Stratiomyidae*

According to R.A. Rozkosný (1983), *Hermetia illucens* usually reproduces in underutilised compost from street latrines and poultry droppings, rotting vegetables and fruits, animal carcasses and military waste, and other decomposing organic residues. Fly larvae are more likely to be found in humid environments than in dry ones. Adults have mouthparts that are not adapted to feed on animal and human blood. That is why *H. illucens* flies are not vectors of blood-borne pathogens.

A. Martínez-Sánchez *et al*. (2011) reported the possibility of egg laying and larval development of *H. illucens* in human cadavers. Thus, in the corpse of an elderly man in the late stages of autolysis found in Northern Spain, larvae of *H. illucens* were found in large numbers. In addition, larvae and pupae of *H. illucens* flies were found in human corpses subjected to decay in Italy (Turchetto *et al*., 2001). At the same time, in the southern, central, and western United States and Hawaii, *H. illucens* fly larvae are saprophytes of superficially buried human remains (Lord *et al*., 1994).

L. Newton *et al*. (2005) noted that *H. illucens* flies undergo five stages of the developmental cycle: egg, larva, pre-pupa, pupa, and adult (female and male). Depending on the temperature and other environmental conditions, pupation lasts from 9 days to 5 months. That is why in their natural habitats, the first flight of these flies can be recorded as early as April, but most of them reach sexual maturity only in late

summer. The larvae look for sheltered and dry places to pupate. Specimens, females and males, emerging from the pupa immediately copulate in the air during flight. Soon after, the fertilised females begin to lay eggs on the edges of the accumulation of decaying organic residues. The eggs take 4 days to 3 weeks to mature, after which the larvae hatch. The latter undergo several stages of development before pupating.

In the first stages of development, as proven by D.C. Hall & R.R. Gerhardt (2002), the larvae are dull, slightly whitish in colour after hatching. They have a clearly visible protruding head with a well-developed chewing apparatus. The larvae undergo three moulting stages and take approximately 30 days to complete their development. During this period, the larvae have an extraordinary appetite and are voracious. However, as adults, flies do not need nutrients and use fats stored during the larval stage. The pupal stage is formed inside a specific skin formation – the puparium.

Thus, according to N.E. Woodley (2001), the puparium is characterised by circular hair growth on the last segment and may be somewhat retracted. The puparium of zoophilic flies of the genus *Hermetiinae* is morphologically characterised by an elongated body consisting of eight segments. There are no spikes on the surface of the puparium. B.M. Drees & J. Jackman (1999) pointed out that some larvae of zoophilic flies of the family *Stratiomyidae* are aquatic or semi-aquatic. During their development, they feed on algae, decomposing organic matter and aquatic organisms. The larvae can also use animal and human faeces, rotting fruit and vegetables, or under the bark of decaying wood as a nutrient substrate.

Sexually mature individuals are black to metallic blue with green-purple or black-yellow patterns (Bondari & Sheppard, 1981). Adult flies have a body length of 15 to 20 mm. Their wings are quite dense, smoky black. In the resting state, flies have their wings pressed against the dorsal part of their bodies (Tomberlin *et al.*, 2002; Üstüner *et al.*, 2003) (Fig. 1).

Figure 1. *H. illucens* fly
***Sourse**: M. de Groot & P. Veenvliet (2011)*

According to F. Oliveira *et al*. (2015), the head of adult *H. illucens* flies is small and narrower than the body. Their eyes are faceted, divided in both sexes. The antennae have a long terminal segment with an elongated flagellum. The antennae are twice as long as the head. The abdomen of flies has 8 segments, which are formed by rectangular plates. Furthermore, their entire abdomen is covered with numerous small bristles that look longer from the caudal angle. These flies have pronounced sexual dimorphism: the female is larger than the male. Males have a short genital apparatus represented by two pairs of lateral lobes. The reproductive apparatus of females is represented by a genital furca. The anal opening in adults looks like a slit in the abdominal cavity of their body.

The zoophilic flies *H. illucens* are characterised by seasonality. Thus, in France, adult flight begins in late April and lasts until 15 November (Alvarez, 2012; Cocquempot & Martinez, 2017). In Spain, the mating season can begin on 2 March and last until 19 November, as in Albania (Üstüner *et al*., 2003). Thus, zoophilic flies *H. illucens* are characterised by a saprophytic lifestyle, which lies in using various organic residues of animal or plant origin as energy

material to ensure the full growth and development. That is why the predominant area of distribution of these flies is associated with places of accumulation of faeces, rotting vegetables and fruits, etc. The life cycle of *H. illucens* flies is characterised by seasonality and a full development cycle consisting of five stages.

Distribution of the zoophilous fly *Hermetia illucens* and results of its introduction

M. Hejda *et al*. (2019) pointed out that in recent decades, invasive species of plants and animals, including insects, have become extremely widespread. This spread of biologically invasive species is recognised as a serious international problem. Certain introduced insect species do not have a considerable negative impact on the habitat. However, some of their species can multiply rapidly and spread to new territories and have a significant negative impact on ecosystems, animal and human health, and can be dangerous pests of crops. Invasive organisms are a crucial factor in transforming natural ecosystems, reducing biodiversity and causing significant economic damage.

As reported by T. Üstüner *et al*. (2003), the current issue of zoophilic flies is their ever-increasing adaptation to unfavourable environmental conditions, and, accordingly, the growth of their range of settlement. Under natural conditions, the population of zoophilic flies is in constant interaction with populations of various host animals, which are integral components of the biocenosis. From an environmental standpoint, the use of these flies at different stages of development is an alternative source of animal protein. Therewith, flies consume fewer resources and provide reserves of high-quality nutrients (Józefiak *et al*., 2016). At the same time, the efficiency with which *H. illucens* larvae can process various organic substrates is the highest among other fly species. Specifically, the introduction of *H. illucens* larvae into poultry manure in poultry houses leads to a 50% reduction in its accumulation and 94-100% inhibition of house fly (*Musca domestica* L.) development (Diclaro & Kaufman, 2015). Furthermore, *H. illucens* larvae can change the microflora of poultry manure, actually reducing the number of harmful bacteria, specifically *Escherichia coli* and *Salmonella* (Erickson *et al*., 2004).

In Panama, *H. illucens* flies have been reported to have a considerably negative impact on banana crops. Female flies lay their eggs on ripe yellow fruits. The hatched larvae quickly penetrate the fruit, leaving dark spots on the fruit. Such bananas lose their consumer appeal and spoil quickly (Stephens, 1975).

According to D.P. Furman *et al*. (1959), *H. illucens* flies are not considered to be vectors of pathogenic pathogens or to be harmful to humans. However, there are many species of zoophilic flies known to transmit anthrax, tuberculosis, brucellosis, paratyphoid, coccidiosis, and other contagious diseases in animals and humans (Lord *et al*., 1994).

According to the findings of the study by E. McCallan (1974) and T. Üstüner *et al*. (2003), it was proved that the natural distribution area of *H. illucens* flies is the countries of North and South America within the range from 40° north latitude to 40° south latitude. In South America, this species of fly is distributed from Chile, Argentina, Uruguay to the United States. The northernmost occurrences of *H. illucens* flies in North America are known in the states of California, Kansas, Iowa, Indiana, Pennsylvania, and along the coasts of Massachusetts and New Hampshire. On the African continent, zoophilic *H. illucens* flies are found from South Africa and Madagascar to Mali; from the Eastern region of Nepal, India, and Sri Lanka to Thailand, Malaysia, and Vietnam, as well as to the Japanese islands of Ryukyu, Taiwan, Indonesia (Java and Sulawesi), and the Philippines. The Australian

and oceanic portions of the range of these flies include the Indonesian island of Irian Jaya, Papua New Guinea, Western Australia, Queensland, New Zealand, Benin Islands, Northern Mariana Islands, Guam, Belau, Marshall and Solomon Islands, Micronesia, New Caledonia, Vanatu, French Polynesia, and Hawaii (Woodley, 2001).

However, according to J.K. Tomberlin *et al*. (2002), the lack of resistance of *H. illucens* flies to low temperatures excluded their distribution in Northern Europe. It was found that flies require an optimum ambient temperature of 27°C and 60% humidity to lay eggs (Sprangers *et al*., 2017), as well as appropriate light intensity and space (Heussler *et al*., 2018). However, according to T. Üstüner *et al*. (2003), *H. illucens* flies are characterised by eurythermia, a species that can tolerate significant changes in air temperature.

In the Western Palaearctic region, especially in Europe, the presence of Hermetia illucens flies has been recorded in several countries. Specifically, they have been found in Malta, Albania, Croatia, Portugal, and Spain, as mentioned by M. Carles-Tolra (2001). According to other researchers, this species was also found in France (Chevin, 1986; Richoux, 2009; Cocquempot & Martinez, 2017). Italy was mentioned in the studies by G. Troiano & E. Toscano (1997), Switzerland – by W. Sauter (1989) and Slovenia – by M. de Groot & P. Veenvliet (2011). This fly species has also been recorded in Turkey and Syria (Üstüner *et al*., 2003) and in Asian countries, namely in China (Wang *et al*., 2023).

At the same time, cases of *H. illucens* detection in Europe were mainly recorded along the seacoast and near seaports. However, cases of inland penetration of this species have been confirmed in Switzerland, where *H. illucens* was found 190 km from the nearest seacoast. Subsequently, such populations successfully reproduced in compost heaps and migrated to more northern areas. The Alps Mountain range is a natural barrier to flies and their larvae, which cause hermetiosis, to the north of Europe. For this reason, some scientists believed that the spread of *H. illucens* flies and their larvae occurs during transport through Mediterranean ports (Üstüner *et al*., 2003). Specifically, the occurrence of *H. illucens* flies in Slovenia is the result of their importation as a means of biological control of house flies (*Musca domestica* L.) and the use of larval feed for animal feeding. At the same time, M. de Groot & P. Veenvliet (2011) pointed out that the full impact of these flies on the country's natural biodiversity has been understudied.

According to E. Molchanova *et al*. (2021), it was proved that scientific research on the possibility of using *H. illucens* fly larvae in the processing of plant waste has already been conducted in Ukraine. Thus, the natural distribution area of zoophilic *H. illucens* flies is the territories of South and part of North America, as well as a range of countries with tropical and subtropical climates. Despite claims that *H. illucens* flies cannot be spread in Northern Europe due to their demanding temperature conditions, there are reports of their presence in a large part of Europe, including Switzerland. Due to the tendency for zoophilic flies to spread through maritime trade routes, one can expect *H. illucens* to enter Ukraine through the seaports of the Black and Azov Seas, given the growth trends in global trade. At the same time, conducting experimental research with *H. illucens* flies and their larvae may pose a risk of their introduction into the natural environment of Ukraine.

Cases of parasitism of zoophilic flies *Hermetia illucens* in mammals

Even though *H. illucens* flies are classical saprophytic organisms that feed mainly on organic residues, there are described cases of their larvae parasitising animals and humans.

At the same time, other flies of the *Stratiomyiadae* family, specifically *Chrysomya bezziana* Villeuve, 1914, which are common in countries with tropical and subtropical climates, are known to cause intestinal myiasis. Cases of larval parasitism in humans were first identified and described by researchers in the 1950s. Furthermore, it was reported that *C. bezziana* larvae can cause genitourinary, intestinal, and skin myiasis in humans (Oothuman & Jeffery, 1984). Later, H.L. Lee (1985) described a case of larvae infestation of the human oral cavity.

Cases of hermetiosis were recorded in animals. A case of myiasis was reported in cattle of the Simmental breed, one year old, from the village of Sucila, Yucatan (Mexico). Chronic tympanic disorder was observed in the animal for 13 days. Despite treatment, the animal died. During the pathological autopsy of the animal's corpse, 20 *H. illucens* larvae at the fourth stage of development were found in the rumen. Some larvae were fixed on the surface of the mucous membrane, while others were freely located in the scar cavity. Inflammation and haemorrhage were observed in the scar mucosa (Manrique-Saide *et al*., 1999). A case of enteric myiasis caused by *H. illucens* fly larvae was reported in a dog from Buenos Aires, Argentina. The larvae were found in the dog's faeces, which contained blood and mucus. According to P.R. Mulieri *et al*. (2019), a dog became infected with the eggs of the hermetiosis pathogen by eating previously mown lawn grass that was being composted.

H.E. Meleney & P.D. Harwood (1935) noted that one of the first cases of fly larvae infestation of the boy's digestive tract was described in the USA. He was diagnosed with all the clinical signs of hermetiotic disease. The disease was characterised by symptoms of stomach and rectum damage with loss of consciousness. Furthermore, a case of classical enteric myiasis, namely hermetiotic disease, in a seven-year-old girl from Kuala Kanchagar, Malaysia, is described. The girl had recurrent acute manifestations of gastrointestinal tract lesions, accompanied by frequent vomiting. During the period of infection, the girl vomited 1-2 times a month. Along with vomit, fly larvae were isolated 3-4 times during the disease, which were identified as *H. illucens* by parasitological examination. Apart from vomiting, no other symptoms were observed. According to H.L. Lee *et al*. (1995), the larvae developed in the cavity of the child's digestive tract. Another case of *H. illucens* larvae parasitism in several human cadavers in Malaysia was reported. It was noted that the fly larvae corresponded to a developmental stage that could have been reached only during the lifetime of humans (Sinniah *et al*., 1994).

O. Calderón-Arguedas *et al*. (2005) reported a case of enteric myiasis caused by *H. illucens* larvae in a 71-year-old woman from a geriatric hospital in Costa Rica. The patient's faecal examination revealed eggs of the nematode *Ascaris lumbricoides*. The woman was treated with Mebendazole. After treatment, the woman was observed to pass *H. illucens* larvae in her faeces. A case of *H. illucens* larvae parasitising the gastrointestinal tract of a 26-year-old woman from Cuba was also reported. The woman was admitted to hospital with symptoms of abdominal pain. Herbal infusions such as southernwood (*Artemisa abrotanum* L.), mint (*Mentha nemorosa* Wild) and chamomile (*Matricaria chamomilla* L.) were used for its treatment. However, during the treatment, *H. illucens* larvae were released along with the faeces. A gastroscopic examination revealed chronic inflammation of the gastric mucosa with erosions of various sizes (González & Oliva, 2009). A case of enteric myiasis was also reported in a 26-year-old man from Sarawak, Malaysia. The patient had diarrhoea with blood impurities for one week. During defecation, fly larvae were found in the faeces. Using molecular genetic methods,

it was established that the larvae belong to the species *H. illucens*. According to A. Amir *et al*. (2020), the symptoms of intestinal myiasis caused by the black soldier fly are non-specific and could range from asymptomatic to acute abdominal pain, diarrhoea, vomiting, and loss of consciousness. At the same time, there is currently no clinically proven treatment for people with hermetiosis.

According to R.F. Harwood & M.T. James (1970), human infection with larvae occurs when consuming spoilt and rotten fruit and vegetables contaminated with *H. illucens* eggs. The researchers believed that fly larvae are quite resistant to the acidic environment of the human digestive tract, and their spiracles can close tightly, which is an additional adaptive mechanism to adverse conditions. At the same time, A.I. Adler & F.P. Brancato (1995) reported that hermetiosis can also manifest itself in the form of skin myiasis. A case of a furuncle in a woman from Seattle, Washington, who had travelled to East Africa, is described. As a result of surgical intervention, a larva of *H. illucens* was isolated from the furuncle cavity. The larvae of other flies, namely *Chrysomya bezziana* of the *Stratiomyiadae* family, also cause ear myiasis. N. W. Ahmad *et al*. (2009). reported a case of larvae in the ears of a newborn child from Malaysia.

Thus, even though *H. illucens* flies are predominantly saprophytic, numerous cases of animal and human infestation by their larvae have been described. This suggests that these flies also can lead a parasitic lifestyle when their larvae penetrate the body. When the larvae enter the mammalian body, they cause mechanical and toxic effects, which is clinically manifested by the development of non-specific symptoms.

Conclusions

The natural distribution area of zoophilic flies *H. illucens* is countries with tropical and subtropical climates. However, due to the intensification of maritime trade routes, *H. illucens* flies have been successfully introduced into the coastal areas of a range of European countries, and have been recorded in some Northern European countries, including Switzerland. Considering the detection of *H. illucens* flies in Slovakia, one should expect reports of their occurrence in Ukraine in the near future. The presence of Ukraine's seaports is likely to create an additional factor contributing to the spread of these flies. Therefore, considering the above, it is likely that the southwestern regions of Ukraine will be the place of potential fly spread. These flies are typical obligate, and according to some reports, conditionally facultative saprophytes that use organic residues for life and development. However, under certain conditions, they can parasitise mammals. The vast majority of cases associated with parasitism by *H. illucens* larvae were characterised by lesions of the digestive tract in animals and humans with the development of enteric myiasis. Most cases of hermetiosis are reported in humans. The disease was accompanied by non-specific symptoms of gastrointestinal disorders. Only a few cases in animals have been described in the available literature, which probably indicates not so much the rarity of *H. illucens* larvae parasitism as insufficient diagnostic studies in case of possible invasion. Human infestations are associated with the consumption of unwashed, spoiled, and rotten fruit and vegetables on which *H. illucens* flies lay their eggs. In most of these cases, it is the violation of hygiene requirements that causes human infection. Therefore, outside the natural habitat of parasitic fly species, there is a constant need for additional research on their migration routes, biocenological relationships, phylogeny, and ontogeny, biological features, including reproduction, possible negative impact on humans and animals, economic losses, as well as the development of measures to control their reproduction and spread. The use of *H. illucens* flies in the biological

conversion of organic waste, animal feeding, etc., requires a thorough risk assessment for the areas where they are introduced, as well as the development of technologies that will consider environmental safety elements.

Further research is planned to develop preventive measures to avoid infection of animals and humans with *H. illucens* zoophilic fly larvae, as well as clinical trials for the further treatment of hermetiotic disease.

Acknowledgements

None.

Conflict of Interest

None.

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Роль зоофільних мух *Hermetia illucens* (Diptera: Stratiomyidae) в поширенні міазів у ссавців

Сергій Мельничук

Доктор біологічних наук, професор
Національна академія аграрних наук України
01010, вул. Михайла Омеляновича-Павленка, 9, м. Київ, Україна
https://orcid.org/0009-0006-6583-3128

Андрій Дубовий

Кандидат медичних наук
Університет Окленда
1023, 85 Park Road, м. Окленд, Нова Зеландія
https://orcid.org/0000-0003-1978-9163

Наталія Сорока

Доктор ветеринарних наук, професор
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0001-7464-6689

Сергій Гончаров

Доктор ветеринарних наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0001-7464-6689

Анотація. Актуальність вивчення питання поширення, особливостей біології та ролі зоофільних мух *Hermetia illucens* родини *Stratiomyidae* у виникненні міазів у ссавців полягає

у здатності зазначених мух паразитувати в організмі тварин, що виявляє загрозу для їх здоров'я та життя. *Мета огляду* – здійснити аналіз наукових досліджень щодо можливого поширення мух *Hermetia illucens*, як потенційного збудника паразитарних захворювань, на території України. Під час дослідження було використано методи аналізу, порівняння та узагальнення наукових джерел. Встановлено, що природним ареалом поширення цих мух є країни Південної та Північної Америки з тропічним і субтропічним кліматом. Проте, цих мух виявляють і в країнах Європи, зокрема: Португалії, Іспанії, Мальті, Франції, Албанії, Хорватії, Словенії та у Швейцарії. Для інтенсифікації біотехнологій аграрного сектору, личинок мух *Hermetia illucens* використовують в якості екологічного утилізатора органічних решток сільськогосподарського виробництва. Вважається, що основною причиною появи мух *Hermetia illucens* в Європі є їх завезення у морські порти та подальша інтродукція на території прибережних зон. Враховуючи означене, можлива поява мух *Hermetia illucens* і в Україні (у південно-західних регіонах). Встановлено випадки паразитування личинок цих мух в організмі ссавців. Переважно їх виявляли за паразитування у шлунково-кишковому каналі. Підтверджено їх здатність викликати типові ентеральні міази. Паразитування личинок перебігає неспецифічно: діарея (фекалії з домішками крові і слизу), метеоризм, блювання, втрата свідомості тощо. Личинки також можуть паразитувати і під шкірою, формуючи фурункули. Частою причиною інвазування людини є споживання немитих перезрілих овочів та фруктів, на яких ці мухи відкладають яйця. Результати огляду можуть бути застосовані для розробки методів контролю за поширенням та розмноженням мух *Hermetia illucens*, як виду, личинки якого здатні паразитувати в організмі ссавців

Ключові слова: ентомози; сапрофітні комахи; личинки; факультативний паразит; герметіоз