



Original/Otros

Presence of microorganisms from isolated *Megaselia* spp. in foodservice establishments

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Abstract

Introduction: the transmission of harmful pathogens by arthropods is an increasing health concern. More concretely, flies are known to be able to transmit the infectious agent mechanically.

Objective: the present work shows a case report occurred from foodservice establishments where were isolated and identified, at the first time, *Megaselia* spp. in the food preparation place. Furthermore, microorganisms were analyzed from these flies.

Method: it is based in entomological and microbiological analysis.

Results: mesophilic aerobic flora and Enterobacteriaceae were found in all the samples, exceeding the limits established from food commodities on 41.7% (5/12) for mesophilic aerobic bacteria and 66.7% (8/12) for Enterobacteriaceae. Furthermore, 25% (3/12) of analyzed flies were found positive to *Escherichia coli*, data that can be linked with the microbiological food results. The most surprising results were the presence of *S. aureus* in 66.7% (8/12) of the analyzed flies.

Conclusions: a binomial relationship among *Megaselia* spp. and bacteria is demonstrated being an important study to demonstrate that must be checked more hygienically measurement in foodservice.

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Key words: *Bacterial pathogens. Foodservice establishment. Food contamination. Megaselia* spp.

PRESENCIA DE MICROORGANISMOS AISLADOS DE *MEGASELIA* SPP. EN LOS ESTABLECIMIENTOS DE SERVICIOS DE RESTAURACIÓN

Resumen

Introducción: la transmisión de patógenos por insectos es una creciente preocupación para la salud pública. Más concretamente, las moscas son conocidas por ser capaces de transmitir el agente infeccioso mecánicamente.

Objetivo: el presente trabajo muestra un estudio en los servicios de restauración en los que se aisló por primera vez en la literatura *Megaselia* spp, detectándose la presencia de microorganismos en estas moscas.

Método: se basa en análisis microbiológicos y entomológicos.

Resultados: la presencia de aerobios mesófilos y Enterobacteriaceae se han encontrado en todas las muestras, superando los límites establecidos en el 41,7% (5/12) para las bacterias aerobias mesófilas y el 66,7% (8/12) para Enterobacteriaceae. Por otra parte, en el 25 y 66,7% de las moscas analizadas se detectó la presencia de *Escherichia coli* y *Staphylococcus aureus*, respectivamente.

Conclusiones: hay un binomio entre la presencia de microorganismos y *Megaselia* spp., lo que demuestra la importancia de mantener una vigilancia más estricta en las medidas higiénico-sanitarias en los servicios de restauración.

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Palabras clave: *Bacterias patógenas. Servicios de restauración. Contaminación de los alimentos. Megaselia* spp.

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Introducción

Flies are also known to carry bacteria such as *Staphylococcus aureus*, *Escherichia coli* and *Campylobacter jejuni*, among others, that are potential human food borne pathogens¹⁻⁴. In this situation, flies amplify the risk of foodborne disease by transporting pathogens from places where the pathogens pose no hazard to place where they do and all segments of a population are at risk of gastroenteritis from food contaminated with the pathogens⁵. The seriousness of gastroenteritis is limited (transitory minor disability; annoying complaints) unless a patient's health is otherwise compromised⁶. Furthermore, many of the infectious agent can survive into the fly, as are houseflies^{7,8} and fruit flies⁹, during two weeks after the exposure and, although it is difficult to find the needed number of microorganism under natural conditions in the fly, the bacteria placed into the food, even though in low concentration, can multiply to reach the needed concentration to infect the humans^{10,11}.

The aim of this study is reflecting a case report occurred from foodservice establishments where were isolated and identified, at the first time, *Megaselia spp.* in the food preparation place. Furthermore, microorganisms were analyzed from these flies.

Materials and methods

Sampling were carried out in four out of twenty-two foodservice establishments from Spain, which were observed a notable number of flies in the food preparation place. Since from a food-safety standpoint, there is a distinct set of natural attributes that enable a flies species to be an effective carrier of foodborne patho-

gens, the flies were catch following the next procedure; the flies were caught with traps designed for that end, conformed by flasks of glass of 500 cc, washed and autoclaved to 121 °C, during 15 min. In the mouth of the flasks, funnels of plastic were adapted in form of invested cones, to facilitate the entrance of the flies, but not their left. The trapped flies (n=12) were those that settled or explored the surface of the foods, for space of one to two minutes approximately. Observed this, we preceded to place on them the flask to force them to enter in. They were trapped individually and analyzed entomologically and microbiologically the same day. The microbial analysis were carried out from the legs of the trapped flies being studied aerobic plate counts, Enterobacteriaceae, *Escherichia coli*, *Staphylococcus aureus* and *Salmonella spp.* according to the ISO 4833 reference method¹², ISO 21528-1¹³, Soriano *et al.*¹⁴, ISO 6888-1¹⁵ and ISO 6579¹⁶, respectively.

Results and discussion

Table I shows the number of trapped flies and the results obtained from the analysis of their legs. Mesophilic aerobic flora and Enterobacteriaceae were found in all the samples, exceeding the limits established from food commodities on 41.7% (5/12) for mesophilic aerobic bacteria and 66.7% (8/12) for Enterobacteriaceae. Furthermore, 25% (3/12) of analyzed flies were found positive to *Escherichia coli*, data that can be linked with the microbiological food results. The most surprising results were the presence of *S. aureus* in 66.7% (8/12) of the analyzed flies. It is evident that there is not an established microflora concentration for flies. However, the presence of certain bacteria as *Sal-*

Table I
Presence of microorganisms in trapped flies

<i>Fly Number</i>	<i>Aerobic plate count (log CFU/g) range</i>	<i>Enterobacteriaceae (MPN/g) range</i>	<i>Escherichia coli</i>	<i>Salmonella</i>	<i>Staphylococcus aureus (CFU/g)range</i>
1	3.2	<3	-	-	-
2	5.1	150	+	-	122
3	3.5	<3	-	-	15
4	4.6	<3	-	-	-
5	2.1	7	-	-	-
6	6.2	>1100	-	-	320
7	5.0	>1100	-	-	90
8	2.8	<3	-	-	-
9	5.4	>1100	+	-	150
10	3.2	240	-	-	30
11	4.3	>1100	-	-	245
12	5.9	>1100	+	-	300

monella, *S. aureus* or *E. coli*, in the legs of the insect prove the contact of the flies with a contaminate surface, becoming a possible carrier of these pathogenic microorganisms.

The trapped fly adults was identifying, checking that they belong to the same family and genus; *Megaselia*. The larvae are myiasis-producing agents in humans and animals^{17,18}, and pestiferous in fruit¹⁹. However, it is important keep in mind that this specie has not been studied in depth, and far from it in the context of food safety, which last stage are the consumers. Within the genera of *Megaselia*, in particular the puparia, other study²⁰ have indicated the difficulty of identifying between species due to their similarity of morphological appearance. The distribution of these diphtheroids is very large, colonizing any type of habitat except cold and dry media. Most of the larvae belonging to the group of the phorid show a predatory behaviour, although some of them behave as parasites. There are species of *Megaselia* that feed on larvae and pupae of other diphtheroid, aphid and myriapods. Some specie of these genera develops at the expense of food substances²⁰. More concretely, it has been identify infecting some foods that contains as bacon, spaghetti, cheese, fruit and flour²¹. The number of flies in a given foodservice establishment is influenced by factors such as: the sanitation practices; the food handling, the activity of the responsible controlling the flies; the location of the establishment; and general facility keeping. The role of the flies as vectors of disease is, in general, far to clear. It has been proven that such pest carry a wide range of disease causing organisms but can they transmit them? There is a lack of studies properly designed to test this role and hence relatively little evidence to suggest that they actually do so. Simply finding an organism in a fly is not sufficient evidence that the fly is acting as a vector for that organism. Equally it is not sufficient to show that a fly could theoretically act as a vector, it must be shown actually to do²² with the following parameters; larvae, temperature, personnel hands hygienic status and incidence of microbial flora in food.

Bearing in mind this fact, can we considerer the *Megaselia spp.* as a potencial vector of pathogenic bacteria? This would be a premature conclusion, given the punctual presence of this specie in food commodities. However, without doubt, ecological conclusions about its presence in the food services is that with the climatic change and the warm temperatures the appearance of new and unknown risk can be possible and additional sampling of the flies is necessary to examine more deeply their role as a foodborne vectors^{23,24}. Understanding the mechanisms of contamination is critical to interrupting them, and thus preventing the infection from reaching the consumers.

In conclusion, the ignorance on the family and especially on the *Megaselia spp.* it is quite important in connection with the European fauna. This study put forward the hypothesis that *Megaselia spp.* plays an important role in the transmission of the bacteria, than

has previously been recognized. Factors supporting this hypothesis are: (i) the ability of flies in general to function as vectors; (ii) a ubiquitous presence of bacteria in the environment; (iii) a seasonality of the bacterial growth with warm temperature peaks; and (iv) the increment of the contamination of the foods after the confirmation of the presence of the flies in these products. This conclusion suggests that in addition to stringent control measures during manufacturing and use of foodstuffs, reducing arthropod presence in kitchens and manufacturing environments could result in a substantial reduction in the transmission of bacterial pathogens.

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