

Bovine Meat Versus Cat Food

¹H. Nihal Acikgoz, ²L. Elmas Kilincarslan and ³Ali Acikgoz

¹Department of Forensic Biology, Forensic Sciences Institute, ²Department of Parasitology, Faculty of Veterinary, Ankara University, Ankara, Turkey

³Ministry of Health Ankara, Provincial Health Directorate, Family Health Center, Ankara, Republic of Turkey

Abstract: The objective of the present study was to investigate food choices of blowflies that have forensic importance and that feed on cadavers and to determine whether they prefer fresh or processed meat. Bovine meat 100 g and cat food 100 g were placed on traps which were put in cages hanged on the campus of Ankara University, Faculty of Medicine. The larvae developed in the bovine meat and in cat food were killed in boiling water. Species from Diptera, Coleoptera and Hymenoptera families were detected and families and species of the insects were determined. The number of adult insects and larvae demonstrated that the species preferred the bovine meat rather than cat food. Food preferences of insects feeding on cadavers are very important in forensic entomology. The insects in the present study opted for bovine meat instead of cat food. However, further experiments and observations are needed in order to confirm food preferences of the insect species likely to be used in solving judicial cases.

Key words: Cat food, diptera, forensic entomology, food preference, insect

INTRODUCTION

Biological, ecological and feeding characteristics of the insects feeding on cadavers are very important for forensic entomologists. The insects having forensic importance and living in the same environment as human beings lay their eggs or larvae on fresh or decayed food and food remains rich in protein (Eren *et al.*, 2010; Dik *et al.*, 2012). Blowflies need protein in order to lay an egg. They obtain this protein from food remains rich in protein left around by people, human and animal excrement, cadavers and animal carcasses (Stoffolano *et al.*, 1995; Sukontason *et al.*, 2003; Zhang *et al.*, 2009; Acikgoz, 2010). The foods preferred by blowflies include fish, chicken, beef, pork and other meat products and dairy products (Zhang *et al.*, 2009).

Generally animal models such as pig (Wolff *et al.*, 2001; Voss *et al.*, 2008; Gomes *et al.*, 2009) and rabbit models (Carvalho *et al.*, 2004; Simmons *et al.*, 2010) are used in experimental studies in forensic entomology (Kaneshrajah and Turner, 2004). In addition to these, meat such as fish, pork, bovine beef and liver and protein-rich cat food due to its odorless and easy protection and storage features are used (Kaneshrajah and Turner, 2004; Clark *et al.*, 2006; De Carvalho *et al.*, 2007). The objective of the present study was to investigate food preferences

of blowflies having forensic importance and feeding on cadavers and to determine whether they preferred fresh or processed meat.

MATERIALS AND METHODS

The present study was conducted on the campus of Ankara University, Faculty of Medicine with an altitude of 850 m at two different times 1 year apart in May 2007 and June 2008. Two different traps were used. Beef 100 mg was placed in one trap and canned cat food with bovine beef in gel 100 g (Whiskas) was placed in the other trap. These traps were placed in cages in order to protect them from birds and cats and hanged outdoor. Hourly controls were made during working hours on weekdays and their temperatures were recorded. Flies left their eggs and larvae.

When the larvae reached the third in-star, all species on the meat and cat foods were gathered. Larvae were killed in hot water and dried and were placed in alcohol of 96%. Adult insects were killed by ethyl acetate. Species of the insects and the larvae were identified under Leica S8APO trinocular stereo zoom research microscope in the Institute of Forensic Sciences, Forensic Entomology/Forensic Biology laboratory. To this aim, Smith's identification key was used (Smith, 1986, 1989).

SPSS 11.5 was used for statistical analyses of obtained data. χ^2 -test was used for evaluations. The $p < 0.05$ was considered significant.

RESULTS AND DISCUSSION

In the present study, researchers investigated food preferences of the insects having forensic importance and feeding on cadavers on the Cebeci Campus of Ankara University and determined whether they preferred fresh or processed meat. Three hundred and seventy five specimens were collected during the present study and their species were identified. The distribution of the species coming to cat food and bovine meat are shown in Table 1. The mean air temperature was $17.16 \pm 2.63^\circ\text{C}$ in May 2007 and $21.28 \pm 1.99^\circ\text{C}$ in June 2008.

Cat food trap: A total of 114 specimens were collected from the cat food and 39 of them were larvae and 75 of them were adult insects.

Bovine meat trap: A total of 261 specimens were collected from the meat trap and 123 of them were larvae and 138 of them were adult insects.

There was a significant difference between the number of the larvae from the eggs left by the adult insects on the bovine meat and that on the cat food ($\chi^2 = 5.394$; $p = 0.02$). Total 64.79% of adult insects and 75.93% of the larvae were collected from meat trap and 35.21% of the adult insects and 24.07% of the larvae were collected from the cat food.

The number of the larvae and adult insects collected from bovine meat in May 2007 and June 2008 was higher than that of the larvae and adult insects collected from cat food.

The most suitable animal models used in forensic entomology are domestic pigs (*Sus scrofa* Linnaeus, 1758). In fact, since pig tissues and human tissues are similar physiologically, larvae development on pigs is not different from larvae development on human beings (Kulshrestha and Satpathy, 2001; Gomes *et al.*, 2007;

Acikgoz, 2010; Anderson, 2011). However, animal studies using pig carcasses should be carried out in areas away from the settlements due to offensive odor that they emit.

The odor emitted during preparation of bovine meat and consumption of the meat by larvae in laboratory environment is not also pleasant (Mandeville, 1988; Sherman and My-Tien Tran, 1995). However, dried cat food does not smell so bad as bovine meat or liver and can be prepared easily. Therefore it is preferred within laboratory environment (Mandeville, 1988). In fact, it has been reported in the literature that dried cat food, canned cat food or catfood in gel is used in order to develop larvae in entomologic studies (Mandeville, 1988; Jenson and Miller, 2001; Parry *et al.*, 2011). Both canned cat food and cat food in gel release their smells slowly. For this reason, they might become moldy and useless when their odor is given off (Kulshrestha and Satpathy, 2001; Gomes *et al.*, 2007).

When dried, moldy parts of food are replaced with fresh ones, eggs and larvae may be lost. However, if researchers do not throw moldy parts then newly added parts also become moldy. Therefore, all eggs and larvae on moldy parts of food should be carried to completely new media.

It has been noted in the literature that if small parts of meat are to be used, the most suitable materials are bovine beef or liver (Sukontason *et al.*, 2003; Carvalho *et al.*, 2004; Kaneshrajah and Turner, 2004; Gomes *et al.*, 2007). In addition, this food should be preferred because it is more similar to human tissue and it is easy to process and obtain. Bovine liver dries very late when compared to bovine beef (Kulshrestha and Satpathy, 2001; Gomes *et al.*, 2007). Drying surfaces of bovine beef provides a shelter for the larvae residing under the beef. Some larvae reaching the end of the third-instar hide between the tendons which begin to dry in the tissue of the meat. These dried parts are appropriate food for dermestids. In the present study, researchers observed that 30% of the insects preferred cat food and that 70% of the insects preferred bovine beef with a significant difference ($\chi^2 = 5.394$; $p = 0.02$).

Table 1: Distribution of the insects coming to meat trap and cat food trap

Insect stages	Order	Family	Cat food trap	Total	Meat trap	Total	Total	Grand total
Larva	Diptera	Calliphoridae	21	39	80	123	101	162
		Sarcophagidae	18	-	18	-	36	-
Adult	Coleoptera	Histeridae	-	-	25	-	25	-
		Diptera	23	75	43	138	66	213
	Diptera	Sarcophagidae	14	-	49	-	63	-
		Fanniidae	3	-	6	-	9	-
		Muscidae	6	-	3	-	9	-
	Coleoptera	Dermestidae	16	-	18	-	34	-
	Hymenoptera	Vespidae	13	-	19	-	32	-
Total			114	114	261	261	375	375

$\chi^2 = 5.394$; $p = 0.02$

CONCLUSION

The present study showed that insects usually preferred natural environment. Indeed, researchers found that insects preferred bovine meat instead of cat food for all purposes like feeding themselves and/or laying eggs and larvae. Insects prefer bovine liver or beef because they are rich in protein and insects are attracted to their smell. Therefore, it can be recommended that researchers should prefer bovine meat as a trap or in collecting eggs and larvae of various species if they work outdoor or in a well-ventilated laboratory.

There can be some researchers wishing to work with cat food to eliminate the intensive smell of meat in laboratories. They should be aware of mould growth when they use small pieces of cat food. Mould growth would affect larvae development negatively. Therefore, researchers recommend using cat food in large amounts if it is the only option. In fact, mould growth will not have a severe effect on larvae development only when large amounts of cat food are used.

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