NEW ZEALAND BIOSECURE

A DIVISION OF SMS SOUTHERN MONITORING SERVICES LIMITED

Profile: *Ctenocephalides felis (Bouché, 1835)*

Common Name: Cat flea

Family: Pulicidae

Origin: Introduced

http://stalemamezivot.blogspot.co.nz/2012/02/this-flea-was-collected-from-feline.html

Geographical Distribution:

Adult fleas (Siphonaptera), with about 2500 species and subspecies described, are ectoparasitic on warm-blooded hosts; about 94 % infest mammals (74 % live on rodents alone) and 6 % infest birds. Fleas are found throughout the world, with a concentration in temperate regions. There are about 20 flea species that will feed on humans. In the past *Pulex irritans* was a serious nuisance and disease vector to humans, but it is now becoming rare in most industrialised countries. Meanwhile, the dog flea, *Ctenocephalides canis*, and even more common, the cat flea, *Ct. felis*, (originally restricted to North Africa and the Middle East, have emerged to take its place, and are now a serious household nuisance and disease vector worldwide (Lehane, 2005).

Known Hosts:

The primary host of *Ct. felis* is the domestic cat but host specificity is not particular high, which is a reason for its common occurrence. The host range includes for example humans, dogs and rodents (Lehane, 2005). Although a long-term population of cat fleas cannot be sustained and infest people, however, if the female flea is allowed to feed for twelve consecutive hours on a human, it can lay viable eggs (http://www.ct.gov/CAES/cwp/view.asp?a=2815&q=376710).

Disease Association

As fleas explore the skin surface, frequently biting, lesions may occur in clusters. The itching skin reaction to bites is of the delayed type. There is usually formation of a wheal around each bite. In rare cases, individuals will have an allergic reaction to proteins of the flea's saliva that can result in hives (flea allergy dermatitis) (Lee *et al.*, 1999; McDermott *et al.*, 2000) or even in difficult breathing (Bitam *et al.*, 2010).

Fleas appear to be poor vectors for viral diseases but play an important role to transmit bacterial and rickettsial diseases.

In the past 250 flea species (mainly *Xeratopsyllus cheopis* but also *Ct. felis*) were recorded to be a specific vector for the plague (Lewis, 1993) caused by an infection of the bacterium *Yersenia pestis* and it still holds great historical importance. Small outbreaks continue to occur throughout the world; around 2000 cases are reported annually. Plague has recently been recognized as a re-emerging disease and remains a serious problem for international public health (Bitam *et al.*, 2010). Reservoir host are rodents and cats. It is most likely that lice also transmit the plague bacteria (Lehane, 2005). The bacteria in the flea cause a blocked gut and starving occurs, leading to more frequent biting. Infection is restricted to the alimentary canal, and is not transmitted transovarially (Bitam *et al.*, 2010). *Ct. felis* is known to carry the bacterium *Burrelia burgdorferi*, the spirochaete that causes Lyme disease, but it does not transfer the disease.

The most important rickettsiosis in New Zealand is murine typhus (flea-borne or endemic typhus) caused by *Rickettsia mooseri* (former *R. typhi*) (Gray, 2007, Roberts, 2001). This disease is one of the oldest recognised arthropod-borne zoonoses and

occurs worldwide (Parola & Raoult, 2006). Fleas, e.g. *Ct. felis*, are the primary vector and rodents the primary reservoir of murine typhus (Traub *et al*., 1978). *R. mooseri* does not affect the fleas life span and they remain perfectly infected (Farhang-Azad *et al.*, 1984). Transmission occurs largely when people rub flea faeces in the bite punction by scratching rather than the agent being injected during the bite itself (Krasnov, 2008).

Also "flea borne spotted fever" (*R. felis*) is transmitted by *Ct. felis* (Psaroulaki *et al.*, 2006). *Ct. felis* is known to carry *Bartonella spp.*, an alphaprotebacterium, whereby *B. henselae* (cat-scratch fever or bartonellosis), in addition to murine typhus, is the only other fleaborne disease currently diagnosed in humans in New Zealand (Heath, 2008).

Ct. canis and *Ct. felis*. can be intermediate hosts of the tapeworms *Dipylidium caninum*. The eggs are ingested by the flea larvae and the cysticercoid stage of the parasite develops in the haemocoel of the adult flea. When infected fleas are swallowed unintentionally by cats, dogs or humans (during grooming or pet handling), the tapeworms enter their definitive host. The worm's eggs pass with the host's faeces into the environment where they may be consumed by flea larvae (Lehane, 2005, Krasnov, 2008).

Taxonomy:

Ct. felis belongs to the family of Pulicidae, which have in common their well-developed eyes, closed antennal grooves and the middle segments of the abdomen with only one row of setae (Jancke, 1938). Other species of the Pulicidae are the *Ct. canis* (dog flea), *Pulex irritans* (human flea), *Xenopsylla cheopis* (rat flea). The sister-group of Pulicidae are the Tungidae, containing the chigoe fleas and the sticktight fleas, and together they form the supra-family of Pulicoidea (Medredev & Lobanov, 1999).

Diagnostic Characters:

Adult fleas are strongly sclerotized from reddish-brown colour. Their compressed shape enables them to move rapidly amongst their host's hair or feathers. They have a piercing and sucking mouthpart and lack a neck between the head and the thorax (The

Trustees of the British Museum, 1949). The antennae are short, situated in lateral grooves, and are erectable in males, allowing the support of the female during copulation. They have strongly developed hind legs that permit them to jump up to 33 cm (Rothschild *et al.*, 1975). This behaviour is possible due to resilin, an elastomeric protein, which is compressed during the flexion of the coxa in the metathorax, and then rapidly relaxed.

Larval morphology is inconspicuous, and newly hatched flea larvae are slender, white, segmented, and worm-like. They are sparsely covered with short hairs and are 1–2 mm in length (first instar) or 4–5 mm length (second instar). Some have an eggtooth, which is used to cut their way out of the egg (Bitam *et al.*, 2010).

Ct. felis females are ca. 2–3 mm in length; males measure 1-2 mm. The cheeks have long spines, the pronotum comb contains 8-11 spines, the abdominal tergites have10-12 setae in a row and the sternites only two (Jancke, 1938).

Biology:

As holometabolous insects, fleas complete a cycle from egg to adult through several larval stages and a pupal stage. The completion of the entire life cycle from egg to adult emergence depends on temperature and humidity and varies between few weeks and 8 months (Jancke, 1938). The known cues to host-finding in fleas are body heat, movement, and exhaled carbon dioxide. Once on a host, adults of both sexes feed on blood, which is required to complete ovary development in females, but they are able to survive up to one year without feeding if they find no host (Lehane, 2005). They prefer warm and moist body areas. Normally it is one blood meal per day, which increases its body weight twenty times. Soon after the blood meal, the flea secrets faeces. Fleas mate on host ca. 8 to 24 hours after a blood meal. One day later the females begin to lay eggs, ca. 25 per day for a month (Webb *et al.*, 2013). Eggs are soft, of oval shape, 0.5 mm and have no sticky surface and may fall off the host's body. Thus, flea eggs may be deposited in all those places to which domestic animals have access. Eggs may hatch in one to 10 days, depending on temperature and humidity (Bitam *et al.*, 2010).

Larvae hatch after 2 to 14 days and are found deep in carpet fibres, mattresses or couch stuffing materials, and organic debris and accumulate in areas where the animal spends a great amount of time (e.g., pet resting areas). They lack legs or eyes but have biting mouthparts. The partly digested blood of adults provides good food recourse, beside debris, as larvae have no sucking mouthparts (Lehane, 2005).

They pass through three stages (instars) of varying duration, depending on the availability of food, relative humidity, and other environmental factors. The ovoid, whitish, and loosely spun pupal cocoon is sticky, and quickly becomes coated with debris, which helps to camouflage it (Krasnov, 2008).

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