Lecture 4:
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Introduction: Cutaneous larva migrans (CLM), frequently termed creeping eruption, is a parasitic skin infection that is caused by the filariform larvae of various animal hookworm nematodes.
Distribution

CLM has a worldwide distribution wherever have had skin contact with soil contaminated with infected animal feces. The disease most commonly occurs in subtropical & tropical regions, but may also occur in temperate climates particularly during the summer months & during rainy seasons.
Caustive agents

*Ancylostoma braziliense*

ahookworm of wild & domestic dogs & cats is the most commonly identified etiologic agent of CLM

Cutaneous (dermal) larval migrants

There are several examples of parasites that are normally found in pets but can be transmitted to humans.
Cutaneous Larva Migrans (creeping eruption)

- caused by non-human hookworm larvae.

- *Ancylostoma braziliense*, *Ancylostoma caninum*, and *Dracunculus stenocephala*.

- Normal cycle:
  - Filariform larvae
  - Pierce skin
  - New host

- Adult worms in intestine of humans
- Larval cycle:
  - Blood

Especially feet and legs, buttocks

- Fail to penetrate the skin fully and burrow in lower epidermis
- Move 1-2 cm per day
- Zigzag tunnel
- Fades opposite end

Successfully invade humans, the intensely itchy infection lasts for months.
For example, a common tapeworm of dogs, *Dipylidium caninum*, can be transmitted to humans.
Immature forms of the common roundworm of dogs, *Toxocara canis* can also be found in humans, causing a disease known as *visceral larval migrans*. 
Immature forms of both cat and dog hookworms can also infect humans, and this results in a disease called cutaneous or dermal larval migrants (CLM or DLM).
The eggs of dog and cat hookworms hatch after being passed in the host's feces, and the next host is infected when these larvae penetrate the host's skin.
Unfortunately, these larvae can not tell the skin of one animal from another, so they will penetrate human skin if they come in contact with it.
However, a human is an unnatural host, so the larvae do not enter the blood stream as they would in a dog or cat.
Rather, they remain in the skin for extended periods of time (weeks or months in some instances) and finally die.
Disease Signs & Symptoms:
The most common portals of entry by the larvae are the exposed areas of the body such as the dorsum of the feet, lower legs, arms and hands, thighs and abdomen also may be involved probably due to lying directly on contaminated sand.
2-Visceral larval migrants (VLM) larvae of specific or non specific host migrates by after skin penetration or directly to the gut then hatching there, then it will be gone to the viscera, liver, lung, muscles or even brain e.g A. lumbricoides, T. cains, T. cati & Ascaris. equi
So, there be irritation & eosinophilia (5% or some times even 70% or 80%) but still it is not diagnostic features as we knew. Weather it is CLM or VLM there is some sort of attraction to words the anterior part of the body (by migration through blood vessels or lymph vessels
This migrate be due to the presence of high tension of O2 in the anterior part of the body espically in the viscera
Note:

*T. canis* cause kid blindness & painful tumor. Toxocara spp. Cause infection of the CNS during the 1\textsuperscript{st} day of infection, the eggs in the gut will hatch into larvae so the curve is high then it will decline with migration of the larvae to other tissues & organs. So liver from 1\textsuperscript{st} day of infection they start to increase gradually till the 1\textsuperscript{st} week then decline.
Lung:
the decrease in the liver will synchronize with increase in the lung due to migration of the larvae from the liver to the lung.
Brain may be from the beginning of inf. the larvae reach the brain directly by remaining only for some times in the lung then migrate & stay in the brain because the brain tissue is soft & represents enriched media for the parasite which remain
Not encysted as thy are away from the immune response & it will increase during the 3\textsuperscript{rd} week & at the same time decrease in lung & liver.
The infective stage in CLM is 3\textsuperscript{rd} stage larvae while in VLM is 2\textsuperscript{nd} stage larvae
As the larvae migrate through the skin and finally die, there is an inflammatory response, and the progress of the larvae through the skin can actually be followed since they leave a tortuous "track" of inflammed tissue just under the surface of the skin.
Treatment of such infections requires surgical removal of the migrating larvae. Considering the location of larvae, just under the skin, in light infections this can be done under local anesthesia and is a relatively simple procedure.
Infections involving large numbers of larvae can be very uncomfortable, and treatment (removal) might require general anesthesia and supportive treatment with anti-inflammatory drugs.
How do humans come in contact with the larvae of dog and cat hookworms? A common source of infection in developed countries is probably sandboxes.
If you have a sandbox in your backyard, it is almost certain that cats in the neighborhood are using it as a large litter box.
Moreover, the sand provides a nearly ideal environment for the hookworm eggs to develop and hatch and for the larvae to survive.
Diagnosis: diagnosis of CLM is based on a history of exposure and clinical appearance of the skin eruption. Allergic dermatitis, secondary bacterial infection
Peripheral eosinophilia and increase in IgE levels are found in a minority of patients. Skin biopsies are usually not effective at establishing the diagnosis.
Histologic examination may lead to edge of the track may contain a larva trapped in follicular canal, stratum cornea or dermis.
CLM of the foot.

(Original image from: Companion Animal Surgery."

CLM of the foot.
Thus, keeping sandboxes covered to prevent cats from defecating in them is a worthwhile "ounce of prevention."
CLM (Original image from and copyrighted by Dermatology Internet Service, Department of Dermatology, University of Erlangen.)
Other places where cats might defecate are also possible sources of infection, including flower beds and vegetable
Garden Dogs are much less fastidious about where they defecate, so it is more difficult to control dog feces as a possible source of infection
If you own a dog two measures that you should take are (1) keep your dog free of hookworms and (2) make sure that you clean up the dog's feces on a regular basis.
Also, if you "walk" your dog in a park or playground, and in particular in my front yard, make sure that you pick up and dispose of any fecal material the dog might leave behind.