



## Red, Cream and Tortoiseshell Cat Society Founded in 1901

### Ringworm

#### Introduction

Ringworm (Dermatophytosis) is a common infectious agent of the dog and cat. Its incidence is related to geographic region, climate and animal husbandry techniques. It is more common in young, stray, sick or debilitated animals. It is of increasing significance because of its potential to affect humans especially those in an immuno-compromised state. The species of significance are *Microsporum canis* (M.canis), *Microsporum gypseum* (M.gypseum) and *Trichophyton mentagrophytes* (T.mentagrophytes). M.canis causes 70% of ringworm infections in dogs and 99% of infections in cats. 5% of dogs are considered carriers, and various studies from cats have set the carrier rate at anywhere between 4 - 20% of healthy stray cats culturing positive for M.canis. A study from the United Kingdom found that 35% of show cats were infected with M.canis (Quaife).

#### Pathogenesis

Ringworm may be defined as fungi with an affinity for cornified epidermis and adnexal structures. Off host survival of spores may be found in keratin or organically rich soils. Infection is caused by skin contact with infected animals, fomites (clippers, brushes) or from the environment (spores may remain viable for 13 months in suitable conditions). Infection is aided if the skin surface has been damaged, such as occurs when animals are groomed or clipped. Once the hair follicle enters telogen it is shed, and the fungal infection lost with it into the environment. By this time hyphae have spread to the adjacent hair follicle and we see the classic circular spreading "ringworm" lesion. Ringworm is often a self-limiting infection with an incubation period of 1 - 6 weeks, and spontaneous resolution due to the development of cell-mediated immunity within 2 - 4 months. The exceptions to this are seen in immunosuppressed animals or in longhaired cats (Persians, Himalayans) and certain breeds of dogs (Yorkshire and Jack Russell terriers and the Pekinese). Young animals are considered more susceptible because of the immaturity of their immune system. They also lack sufficient fungistatic epidermal sebum or linoleic acid. M.canis is considered highly contagious. M.gypseum is a geophilic ringworm and spread to other animals is unlikely to occur as the host usually mounts an effective immune response that hastens cure. T.mentagrophytes is a rodent ringworm and is considered to be contagious thus requiring treatment.

#### Diagnostic Techniques.

Woods Lamp - Emits 253.7nm UV light which cause the tryptophan metabolites produced by dermatophytes to emit fluorescent light (bright apple green). Only 50% of M.canis fluoresce. Warm for 5 - 10 minutes before use. Many false positive and negative results.

Direct examination - KOH preps - examine hair shaft for ectothrix arthrospores and hyphae. Interpretation difficult - positive in only 10 - 25% of cases (Schmidt A.). Do not confuse with melanin granules or saprophytic fungi, dermatophyte spores are never pigmented.

Fungal culture - MOC - Blood Agar, Sabourauds dextrose agar; DTM, Dermduet plates  
Dermatophytes metabolize the media to produce alkaline byproducts causing the phenol red indicator in the media to go red. Saprophytic metabolize the media to acidic by-products, and only produce alkaline byproducts after several weeks. Colour change occurs within 3 days therefore check for colour changes daily. It may take 3 weeks for macroconidia to form to enable identification of fungal species.

## **MANAGEMENT**

Aim

- to eliminate the infection from the patient
- to decontaminate the environment
- to reduce dissemination of infective spores

## **TREATMENT**

### **TOPICAL**

Full body clipping was once considered to be mandatory for all infected animals. Recent recommendations have changed, and clipping is not recommended unless you are dealing with long haired cats with generalized infections. Clipping abrades the skin, causes the infection to become generalized and increases environmental contamination. These cases are better handled by clipping the hair surrounding the local lesion with scissors and burning all contaminated hair (Moriello, 1996). Topical therapy should be used in conjunction with systemic anti-fungal treatment. It is used to treat infected animals, prevent contamination of disease free animals and to prevent further contamination of the environment. Technique is important, do not rub the shampoos or rinses into the coat, apply the products gently to avoid skin abrasion. Econazole - Sebazol® . Econazole is an effective topical anti-fungal agent. Localized reactions may be seen and this reflects reactions seen to all imidazole agents rather than econazole itself. Enilconazole - Imaverol® is registered for use on horses, cattle and dogs. As a leave on dip, enilconazole is an effective adjunct to systemic treatment. There are reports of hepatotoxic or idiosyncratic reactions particularly in Persian cats. Studies have failed to document these reactions, and many consider it safe to use in cats at the recommended concentrations. (deJahma et al)

### **SYSTEMIC**

All systemic treatments should continue at least one month beyond the last negative fungal culture. It is indicated for immunosuppressed or sick animals; for M.canis in longhaired cats; in Trichophyton infections; in generalized infections and to decrease zoonosis.

Griseofulvin - inhibits fungal cell wall division by altering the structure and function of the microtubules. It is fungistatic. Dose rates - microsize - 50 - 120mg/kg divided into twice daily doses, given with a fatty meal. ultra microsize in polyethylene glycol (PEG)- 5mg/kg BID, PEG is toxic to cats,

calculate the dose carefully. Adverse rxn: teratogenic; GIT; bone marrow suppression; severe neutropaenia in FIV +ve cats

IMIDAZOLES - ketoconazole, itraconazole, econazole, enilconazole, miconazole, saperconazole, fluconazole. The imidazoles inhibit cytochrome P450 14 $\alpha$ -demethylene enzyme that is essential in ergosterol (fungal cell wall) synthesis. Imidazoles may be fungistatic or fungicidal depending on the dose.

Ketoconazole - Nizoral<sup>®</sup> 200mg tablets - dose 5 - 10 mg/kg BID (Medleau & Chalmers). Costly, less effective compared to other imidazoles against *M.canis*. Will cure 97% of cats and 90% of dogs in 6 weeks. Accumulates on the skin via sebaceous gland secretions. Adverse rxn: hepatotoxicity; elevated serum liver enzymes, icterus, lightening of the hair coat, cataracts, decreased steroid synthesis; anorexia, teratogenic in rats, drug interactions with anticonvulsent drugs (da Costa, Meredith, Sigler)

Itraconazole - Sporonox<sup>®</sup> (100mg capsules) - dose 5mg/kg BID, with food. Considered one of the drugs of choice to treat dermatophytosis. It is more effective than ketoconazole with less side effects. It is bound to keratinocytes and secreted in sweat and sebum. Pulse therapy is used in man for onychomycosis (400mg SID for 1 week/month). Disadvantages – difficult in splitting capsule for cats/kittens. Adverse rxn: idiosyncratic hepatotoxicity; vasculitis

Saperconazole - new generation triazol, not yet available commercially. Achieves high tissue concentration. Dose rates 2.5 - 5 mg/kg SID

Terbinafine - (Lamisil<sup>®</sup>) 125mg and 250mg tablets. Allylamines inhibit squalene epoxydation causing an accumulation of squalene in the fungal cell and a subsequent ergosterol deficiency and cell death. Available as a cream or tablet form. It is effective against dermatophytes but not malassezia. Dosage recommendations are 10 - 20 mg/kg SID for 6 weeks. In refractory or resistant cases 30mg/kg SID are being used. There are few reported side effects. In man, it is very effective. The cure rate is higher, shorter treatment periods are required, and there are lower relapse rates compared to other anti-fungal agents. It is well absorbed, lipophilic and keratinophilic and is distributed to the skin by positive diffusion and via the sebum. Elimination from plasma is slow and it is important to liver and renal function as it is cleared via the kidneys. Toxicities include neutropaenia, pancytopenia, toxic epidermal necrolysis, and hepatobiliary dysfunction. Adverse reactions in man run at 10% and are mainly GIT. 2 -3% of topical applications cause pruritus, burning or erythema the site of application. (Manciati M. et al. Sparkes A.H.).

Fungal Vaccines to *M.canis*- Vaccines reduce the severity but not incidence of the disease if given prior to infection. If given after infection they reduce the severity and increase resolution of lesion but do not decrease the time taken to achieve cure. They may be useful whether there is refractory infection, or to decrease the shedding of infected hairs into the environment.

### **Environment decontamination**

Thorough daily vacuuming. Treat bedding and vacuumed dust as a biohazard - burn, or dispose of appropriately. Most effective environmental cleansers that rapidly killed spores were 1% formalin, or undiluted bleach. More practical is the use of 1:10 bleach, 1% formalin or enilconazol. Clinafarm<sup>®</sup>

is a fogger containing enilconazole. It is used to fumigate poultry houses and is effective in decontaminating homes.

**Cattery or multiple cat household recommendations.**

Decrease all visitors to the cattery. Mackenzie brush culture all cats. Quarantine all positive cats, clip to reduce further environmental contamination. Treat all cats with a topical treatment such as Sebazol<sup>®</sup> twice weekly. All culture positive cats should be treated past two negative fungal cultures. Quarantine all new cats or those who have attended shows and do not reintroduce to colony until after two negative cultures. Treat all kittens systemically after weaning. Culture all cats twice yearly to identify asymptomatic carriers.

**ALWAYS seek the advise of your veterinarian**