DERMATOPHYTOSIS – UPDATE ON DIAGNOSIS AND THERAPY
Dr Susan Paterson
Rutland House Veterinary Hospital,
Abbotsfield Road, St Helens WA9 4HU
UK

The World Association of Veterinary Dermatology has recently commissioned clinical practice guidelines on dermatophytosis. These updates on diagnosis and therapy are taken from that paper which has been published as an open access paper in Veterinary Dermatology, a link to which can be found on the WAVD website (Moriello K.A. et al., 2017).

DIAGNOSIS OF DERMATOPHYTOSIS
Diagnostic tests in cases of dermatophytosis should have two principal aims. The first should be to confirm as accurately and as quickly as possible that active infection is present in order to make an informed decision about therapy, i.e. treat or not treat, euthanase or quarantine? The second should be to establish that the infection has been successfully treated i.e. the animal poses no infection risk and that the animal is cured? In order to make a diagnosis a range of complementary diagnostic tests should be employed which includes Wood’s lamp of infected material; direct examination of hairs to document active infection; dermatophyte culture by toothbrush technique to diagnose fungal species involved and monitor response to therapy and biopsy with special fungal stains for nodular or atypical infections.

Woods lamp examination is a highly specific and sensitive test to identify cases of Microsporum canis. Hair infected with M. persicolor, M. gypseum and Trichophyton mentagrophytes do not fluoresce. Reports about the percentages of isolates of M. canis that fluoresce, is very variable and ranges from 30-74%. Fluorescing hairs are most likely to be found in untreated infections; fluorescence may be difficult to find in treated cats. False positive and false negative results are most commonly due to inadequate equipment, lack of magnification, patient compliance, poor technique or lack of training.

Dermoscopy is a non-invasive diagnostic tool that allows for illuminated magnification of the skin. It is widely used in human medicine in the clinical diagnosis of a number of skin diseases, especially those involving hair and follicular abnormalities. Recently published studies of dermoscopy of normal cat skin and cats with dermatophytosis have suggested that cats with dermatophytosis had hairs that were opaque, slightly curved or had broken hairs with a homogenous thickness ("comma hairs").

Direct examination of hair and scales for hyphae and/or fungal spores provides rapid confirmation of infection. Hair should be plucked from the periphery of active lesions and then mounted in mineral oil, compounded chlorphenolac, or potassium hydroxide (KOH) of varying concentrations. The spores can be visualised aligned down the shaft of the hair.

Fungal culture should not be used as the sole diagnostic test in cases of dermatophytosis, because of the risk of both false positive and false negative results. Three best methods for sample collection for small animals are hair coat brushings, hair plucking and sticky tape sampling. Hair coat brushings and sticky tape sampling appear to be the most useful techniques, the latter being accepted as the most sensitive.

PCR detection of dermatophyte DNA can be a helpful diagnostic test, however a positive PCR only indicates the presence of dermatophyte DNA and gives no indication as to whether the fungus is viable and is therefore part of an active infection. It should therefore not be used as a single test to identify the presence of infection, but may be useful when used with other tests.

It is important that therapy is not discontinued until both a clinical and mycological cure have been achieved. Numerous ways can be employed to monitor the response to therapy. The resolution of clinical lesions is useful, as is the lack of fluorescence with a Wood’s lamp, where the isolate has previously been
shown to be fluorescent. Negative fungal cultures are essential. Mycological cure is normally defined as two negative cultures 7 days apart. Although a positive PCR is not specific for active fungal infection, a negative PCR in a treated cat is compatible with cure. Negative fungal culture from cats with no lesions and a negative Wood’s lamp (except for glowing tips) is compatible with cure.

**TREATMENT OF DERMATOPHYTOSIS**

*Topical therapy*

Transmission of dermatophytosis occurs via direct contact with infective material originating from the skin and hair coat of infected animals. The main aim therefore of topical therapy is to decrease the infectious, contagious, and zoonotic risks by disinfecting the hair coat and minimizing contamination of the environment. Topical therapy should be used in all localised cases of dermatophytosis and in young animals. Where disease is recurrent or generalised then systemic therapy is usually needed but the addition of topical treatment in such cases has been shown to speed the time to resolution of the disease. Currently effective topical therapies that are recommended in dogs and cats include twice weekly application of lime sulphur, enilconazole or a miconazole/chlorhexidine shampoo. Accelerated hydrogen peroxide products as well as climbazole and terbinafine shampoos show promise, but there is little specific evidence currently to support their use. Miconazole shampoos are effective in vitro but in vivo are most effective when combined with chlorhexidine. Chlorhexidine as monotherapy is poorly effective and not recommended.

*Systemic therapy*

Systemic antifungal therapy is important in all cases of generalised dermatophytosis. Systemic therapy targets the site of the infection to prevent further spread of lesions on the body, continued seeding of the hair coat with infective spores, and a source of infection for other animals and people. The most commonly used systemic antifungal drugs for dermatophytosis in veterinary medicine are itraconazole, ketoconazole, terbinafine, and griseofulvin. All of these drugs are teratogenic so should not be used in pregnant or breeding animals. Itraconazole and terbinafine are the most effective and safe treatments for dermatophytosis. Itraconazole is widely accepted as being a safe and effective therapy for dermatophytosis in cats to treat *M. canis*. It can be used as sole therapy or in combination with topical drugs. Two protocols that are commonly employed include one by Carlotti (2010) who recommended 5mg/kg orally for a week on and week off until mycological cure was obtained which took 56 days to mycological cure. A second protocol is one recommended by Newbury (2011) who used Itraconazole at a dose of 10mg/kg daily for 21 days with either lime sulphur or a chlorhexidine/miconazole product twice weekly. Mycological cure was achieved in 36 days (Newbury et al., 2011). Terbinafine is not licensed for the treatment of dermatophytosis in dogs and cats however numerous studies have detailed its efficacy. A study by Newbury (2015) suggests 20-40mg/kg orally daily for 21 days with lime sulphur twice weekly as an effective way to resolve infection in a shelter environment (Newbury et al., 2015). Ketoconazole and fluconazole are less effective treatment options and ketoconazole has more potential adverse side. Griseofulvin is effective but also has more potential side effects compared to itraconazole and terbinafine and is now poorly available in many countries. Despite early work on Lufenuron suggesting it may be useful in the therapy of dermatophytosis more recent controlled studies have shown it has no in vitro efficacy against dermatophytes, does not prevent or alter the course of dermatophyte infections, does not enhance the efficacy of systemic antifungal or topical antifungal treatments and has no place in the treatment of dermatophytosis. Antifungal vaccines do not protect against challenge exposure but may be a useful adjunct therapy.

*Environmental therapy*

Infection from the environment alone is rare and therefore environmental disinfection is most important to minimize the risk of disease transmission to people and other animals. From a clinical perspective, the main aim of it is to shorten the course of treatment by preventing/minimizing false positive fungal culture or PCR results due to fomite carriage of spores on the hair coat obtained from the environment. Where contamination of an animal’s coat with spores from the environment produces a false positive fungal culture it can lead to prolonged systemic and/or topical therapy and increased periods of confinement of pets. Whilst this is undesirable in all animals it can be particularly detrimental in young animals where the critical time period for socialisation may be lost. Disinfection of non-porous surfaces involves three steps. The first is the mechanical removal of all debris via vacuuming or sweeping. Disinfectants will not work in...
the presence of organic debris. The second is the washing of the target surface with a detergent until the area is visibly clean. The use of a detergent is important because it will lift debris from surfaces however it should be thoroughly rinsed from the target surface to prevent inactivation of the subsequent application of disinfectants. These two steps are the most important and in many cases will decontaminate a surface without the use of disinfectants. The application of a disinfectant as the final step will act to kill any residual spores. Ideal antifungal disinfectants should have good antifungal efficacy and be non-toxic with a low irritancy to the animals and users. In addition, it should be affordable, easy to apply and compatible with surfaces it is to be used upon. Disinfectants that have been shown to be useful include sodium hypochlorite, enilconazole and accelerated hydrogen peroxide.

**Confinement**
Where dermatophytosis is identified within a cattery environment rather than in an isolated pet, an important part of the treatment regime is the segregation and confinement of animals. The confinement of infected animals is important in that it allows more effective decontamination of the environment and reduces the risk of transmission of dermatophytosis to other animals and people especially children. It is unfortunate that the ages of cat that are most susceptible to developing dermatophytosis are the ones that are the most difficult to confine. This includes kittens that usually contract the disease at a time when socialisation is important and older immunosuppressed cats that may have concurrent disease and need additional medical therapy. Whilst it can be challenging to ensure that animals are handled adequately during their treatment period, everything should be done to minimise stress and encourage socialisation during periods of confinement. Dermatophytosis is a curable disease, but behaviour problems and socialization problems can be life-long if the young or newly adopted animals are not socialized properly.

**References**