

Guidelines for the management of Tinea Capitis in children

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Definition

Tinea capitis (TC) is a dermatophyte infection of the scalp hair follicles and intervening skin.^{1,2}

Dermatophyte classification and pathogenesis of TC

Dermatophytes are keratinophilic fungi which belong to three genera: *Trichophyton*, *Microsporum*, and *Epidermophyton*. On the basis of host preference and natural habitat, they are classified as anthropophilic, zoophilic, and geophilic.

TC is mainly caused by anthropophilic and zoophilic species of the genera *Trichophyton* and *Microsporum*.^{1,2}

On the basis of the type of hair invasion, dermatophytes are also classified as endothrix, ectothrix or favus.

In endothrix infection the fungus grows completely within the hair shaft, the hyphae are converted to arthroconidia (spores) within the hair while the cuticle surface of the hair remains intact.

In ectothrix infection hair invasion develops in a manner similar to endothrix except that the hyphae destroy the hair cuticle and grow around the exterior of the hair shaft. Arthroconidia may develop both within and outside the hair shaft. Elongated hyphae, parallel to the long axis of the hair, persist within the hair.

Favus is characterized by production of hyphae which are parallel to the long axis of the hair shaft. When the hyphae degenerate, long tunnels are left within the hair shaft.^{1,2}

Ectothrix anthropophilic infections potentially spread rapidly whereas endothrix and favic infections are less contagious.³

Epidemiology

TC occurs primarily in prepubertal children aged 3 to 7 years and occasionally in infants and adults.^{2,4,5} The reported prevalence of the disease in European children ranges between 0.23% and 2.6% in Barcelona and London respectively.^{6,7}

The main aetiological agents of TC in Europe nowadays are shown on table 1.⁸ Although there is an overall increase in the number of anthropophilic scalp infections, *M. canis* remains the predominant organism with the highest incidence in the Mediterranean (Spain, Portugal, Italy, ex-Yugoslavia countries, Greece) and their bordering countries such as Austria, Hungary, Germany and Poland. Stray cats and

dogs as well as pet puppies, kittens and dwarfish rabbit are the most important carriers and transmitters of this zoophilic dermatophyte.⁸

Anthropophilic TC has been mainly reported in certain urban areas of Europe like London, Amsterdam, Paris, Madrid and Stockholm, predominantly in children of Afro-Caribbean extraction. *T. tonsurans* is the most often reported from the UK and the Netherlands whereas *T. sudanense* and *M. audouinii* from France. These dermatophytes can be transmitted from person to person and through fomites.^{8,9}

T. schoenleinii TC is the most chronic infection, usually acquired before adolescence and extending into adulthood. Fortunately it has nearly disappeared from the continent and can be found sporadically in Eastern Europe.¹⁰

Clinical presentation

The clinical presentation of the disease varies depending on the aetiological agent and type of hair invasion, the level of host resistance and the degree of inflammatory host response.⁴

There are three main clinical forms: a) tinea capitis superficialis (non-inflammatory form), b) tinea capitis profunda (inflammatory form), and c) tinea capitis favosa (favus). The noninflammatory form may have a variety of clinical patterns, ranging from diffuse scaling to black dot alopecia. The inflammatory form of tinea capitis may present as agminate folliculitis or kerion Celsi. Favus is a rare type of TC characterized by typical honey-colored, cup-shaped, follicular crusts called scutula. Kerion Celsi and favus have the potential to cause scarring and permanent alopecia. (table2, figure 1).^{2,3,11}

A dermatophytid (id) reaction characterised by non fungal, generally pruritic, papular or vesicular eruption that typically begins on the face and then spreads to the trunk has been described after initiation of systemic antimycotic treatment. This reactive phenomenon may be a result of a cell-mediated immune response by the patient to the dermatophyte, triggered by the antimycotic treatment which should not be discontinued.

Dermatophytid (id) reaction can also manifest as erythema nodosum.²

Dermatophytosis may also induce transient skin and serological manifestations of systemic lupus erythematosus.¹²

Differential diagnosis

The non-inflammatory diffuse-scale form of TC should be mainly differentiated from seborrheic dermatitis, atopic dermatitis, tinea amiantacea and psoriasis. The moth eaten and black dot alopecia patterns should be differentiated from alopecia areata and trichotillomania whereas the inflammatory forms should be distinguished from bacterial infections.^{2,3,11}

Asymptomatic dermatophyte scalp carriage

Asymptomatic carrier is defined as a person without signs or symptoms of TC but with dermatophyte - positive scalp culture.

Asymptomatic carriage (AC) seems to be organism specific. Anthropophilic dermatophytes such as *T. tonsurans*, *T. violaceum*, and *M. audouinii* have been associated with high rates of AC. These organisms generally produce mild signs of infection. Consequently this relative lack of host response enables them to escape detection.

On the contrary zoophilic dermatophytes such as *M. canis* or *T. mentagrophytes* usually produce overt signs of infection and are, therefore, less likely to lead to an asymptomatic carrier state.

Asymptomatic carriers at home or school are potentially important sources of disease transmission.^{2,3}

Laboratory diagnosis

Specimen collection

The specimen should be collected by experienced staff, in a sufficient amount, from the edge of the infected area, which corresponds to the active zone of the lesion.

Any crusts should be carefully removed with tweezers and the lesion should be disinfected with 70% alcohol before sampling to remove contaminants such as bacteria. Hair roots and crusts should be plucked and suppurating lesions swabbed. Due to electrostatic attraction, plastic boxes are unsuitable, so that specimens have to be collected in sterile glass containers.¹³ (*Grading of recommendation C; strength of evidence IV*)

Human or animal asymptomatic carriers may be detected by rubbing the whole scalp or hair with a sterile piece of carpet, a sterile swab humidified with distilled water, a toothbrush or hairbrush. The brush or carpet square is especially useful methods in suspected asymptomatic carrier cats or other pets. They are combed through the coat, trapping fungal spores with hair and debris, and then impressed on the surface of the culture medium.¹³

Microscopic examination

Direct microscopic examination of skin scrapings and hair is the most rapid method of establishing fungal etiology. Although it has been reported to have 5-15% false-negative results in routine practice, depending on the skill of the observer and on the quality of sampling, it is essential, as it may allow the clinician to start treatment, pending culture results.^{13,14}

Hair roots and skin scrapings are mounted in 10-20% potassium hydroxide solution with or without dimethyl sulfoxide (DMSO). The slide is gently heated and viewed under the light microscope.

Other dissociating agents have also been proposed including Amann's chloral-lactophenol which allows clearing without heating.

Congo red (a *b*-D-glucans stain) or Calcofluor white 0.1% solution (a chitin binding fluorochrome dye) added to the clearing reagent facilitate the visualization of fungal structures but the latter requires use of a fluorescence microscope.¹³

The appearance of infected hairs depends on the invading dermatophyte species (Table 3). Hyphae must be differentiated from fibres of cotton wool or synthetic fabrics and from "mosaic" which is a network of debris including cholesterol crystals around epidermal cells.

Culture

Plucked hair fragments and skin scrapings are placed directly on culture medium. The most common medium is Sabouraud's agar with chloramphenicol and cycloheximide to inhibit bacterial and saprobic fungal contamination.

Cultures are usually incubated at 20–25 °C for 3–4 weeks (or for up to 6 weeks if *T. verrucosum*, *T. violaceum* or *T. soudanense* are suspected) and macroscopically screened at least twice a week for signs of fungal growth. Fungal identification is based on macroscopic (growth characteristics, pigment formation) as well as microscopic morphology (formation of macroconidia and microconidia or other typical elements). Additionally, in case of atypical isolates, some biochemical or physiological tests may be performed such as the search for urease activity or the *in vitro* hair perforation test.¹³

Numerous methods for rapid nucleic acid-based distinction of dermatophyte species have also been described in recent years but are not routinely performed in clinical practice.¹⁵⁻¹⁷

Wood's light examination

The utility of Wood's light examination depends on whether the dermatophyte is an ectothrix or endothrix. Ectothrix dermatophytes such as *M. canis*, *M. audouinii* and *M. distortum* produce infection which causes the hair to fluoresce bright green.¹⁸ Wood's light examination may, therefore, be a useful diagnostic aid for school screening surveys in ectothrix anthropophilic cases.

On the other hand, endothrix dermatophytes like *T. tonsurans* and *T. violaceum* do not fluoresce at all³ and the use of Wood's light for screening and monitoring TC infection is limited.

Treatment

Tinea capitis always requires systemic treatment because topical antifungal agents do not penetrate the hair follicle. Topical treatment is only used as adjuvant therapy to systemic antifungals.

Factors that may influence the choice between equally effective therapies include tolerability, safety, compliance, availability of liquid formulation and cost.

Since the late 1950s, griseofulvin has been the gold standard for systemic therapy of TC. It is active against dermatophytes and has a long- term safety profile. The main disadvantage of griseofulvin is the long duration of treatment required (6-12 weeks or longer) which may lead to reduced compliance.¹⁹

The newer oral antifungal agents including terbinafine, itraconazole and fluconazole appear to have efficacy rates and potential adverse effects similar to those of griseofulvin in children with TC caused by *Trichophyton* species, while requiring a much shorter duration of treatment. They may be, however, more expensive.²⁰ (*Grading of recommendation A; strength of evidence 1a*). Consequently, the treatment decision between griseofulvin and newer antifungal agents for children with *Trichophyton spp* tinea capitis can be based on an individual patient on the balance between duration of treatment/compliance and economic considerations.

On the contrary griseofulvin is still the treatment of choice for cases caused by *Microsporum* species. Its efficacy is superior to that of terbinafine²¹ (*Grading of recommendation A; strength of evidence 1b*), and although its efficacy and treatment duration is matched by fluconazole²² (*Grading of recommendation A; strength of evidence 1b*) and itraconazole²³ (*Grading of recommendation A; strength of evidence 1 b*) griseofulvin is cheaper. It must be noted, however, that griseofulvin is nowadays not available in certain European countries (e.g. Belgium, Greece, Portugal, and Turkey).

Pending culture results, the choice of initial treatment should be based on patient's history (e.g. ethnic origin, contact with animals, practice of some particular sports), clinical presentation (e.g. the black dot pattern of tinea capitis is commonly caused by *T. tonsurans*), direct microscopy (endothrix or ectothrix hair invasion) and compliance/ cost.

It must be noted that country- specific prescribing information, and formula availability of any antifungal should be considered prior to prescription (table 4).

Oral

Griseofulvin

Griseofulvin is fungistatic and inhibits the mitosis of dermatophytes by interacting with microtubules and disrupting the mitotic spindle. It is available as tablet or oral suspension. The paediatric dose authorised for use in European countries is 10mg/kg/day, although 20- 25mg/kg/day is the standard international dose using the microsize formulation for treating tinea capitis. When the ultramicrosize formulation is used a dose of 10-15mg is recommended because it is absorbed more rapidly than the microsize form.²⁴ The drug should be given in a single or divided doses daily with a fatty meal (e.g. creamy yoghurt or whole milk) for 6-12 weeks (possibly longer) until the patient tests negative for fungi (light microscopy and culture) .^{23,24} As is the case with all systemic antifungals longer duration treatment and higher dose of griseofulvin is needed for ectothrix (e.g. *M. Canis*) than endothrix (e.g. *trichophyton spp*) infections. Mycological cure and efficacy rates are generally high being in the range of 80-96 % .²⁵

Treatment failures can be observed due to poor compliance, fungal resistance, drug interactions or side effects.

Side effects of griseofulvin include headache, gastrointestinal disturbances, allergic reactions, hepatic toxicity and leucopenia.

It is contraindicated in children with porphyria, lupus erythematosus or severe liver disease.²⁶

Drug interactions can occur with warfarin, phenobarbital and cyclosporine.²⁴

²⁵ The main disadvantage of griseofulvin is the long duration of treatment.^{25- 28}

Terbinafine

It is a member of allyamine class of drugs, belonging to the new generation of antifungal agents. It is fungicidal and inhibits squalene epoxidase, a key enzyme in the biosynthetic pathway of sterol synthesis in fungal cell membrane. It is well absorbed and binds strongly and non specifically to plasma proteins. The absorption characteristics are not altered when terbinafine is taken with food. Its clearance in children is 40% higher than in adults.

It is available as tablet.

The standard daily dose is 62.5 mg (10-20kg); 125mg (20-40 kg) and 250 mg \geq 40kg). Some suggest a weight-based dose of 4 to 5 mg/kg per day as an alternative.

²⁹ Terbinafine is concentrated in the hair and may remain present at fungicidal concentrations for several weeks after a course of treatment has been completed.³⁰ The duration of treatment is generally 4 weeks though shorter durations (2 weeks) have also been reported to be effective.^{28, 31, 32} (*Grading of recommendation A; strength of evidence Ib*)

Higher dosages (10-25 kg: 125 mg/day; >25kg: 250 mg/day or 12.5 mg/kg/day) or longer duration of treatment (8-12weeks) may be required for *M. canis* infection.^{33- 36}

Side effects of terbinafine are rare and include gastrointestinal symptoms, rashes and headache. Liver enzyme abnormalities and drug reactions are occasionally seen. Plasma concentrations are reduced by rifampicin and increased by cimetidine.³⁰

Itraconazole

Itraconazole is a triazole antifungal agent against *Trichophyton and Microsporum spp*. It exhibits both fungistatic and fungicidal activity depending on its

concentration in the tissues though its primary mode of action is fungistatic by inhibiting the cytochrome P-450 dependent synthesis of ergosterol, which is a vital component of fungal cell membranes.

It is available as capsules or oral solution. Itraconazole capsule formulation should be ingested with a meal whereas the oral solution in the fasting state for optimum bioavailability. The response to therapy does not appear to depend upon the formulation administered (capsules versus suspension).

The dose is 5 mg/kg/day given continuously or by repeat pulsing. Where the oral solution is used, dosage is reduced to 3mg/kg/day.³⁷

Using the continuous regimen, the duration of treatment for *Trichophyton spp.*³⁸ (recommendation A; strength of evidence I b) and *Microsporum spp* tinea capitis³⁹ (recommendation B; strength of evidence II b) is 2 and 6 weeks with cure rates 85.7 and 88% respectively. It must be noted that the 6 week regimen of itraconazole is of comparable efficacy to griseofulvin, in cases of *Microsporum*-TC.¹⁹

In the pulse regimen (one pulse of 5mg/kg/day for 1 week with 2 weeks off between the first two pulses and 3 weeks between the second and third), the number of pulses required for the treatment depends in part on the severity of the TC⁴⁰ (Grade of recommendation B; strength of evidence II b) In this way it may be possible to individualize the number of pulses administered according to the clinical response.

Side effects of itraconazole include headache, gastrointestinal complaints, rash and occasionally liver enzyme abnormalities.

Itraconazole may increase plasma concentration of cyclosporine, certain benzodiazepines (midazolam, triazolam, alprazolam, and estazolam), digoxin, and cisapride. Concomitant use of H₂-receptor antagonists, phenytoin, isoniazid, and rifampin may reduce the plasma concentration of itraconazole .

Use is strongly discouraged for patients with elevated or abnormal liver enzymes, active liver disease or have experienced liver toxicity with other drugs. It is contraindicated in patients with evidence of ventricular dysfunction such as congestive heart failure.

Fluconazole

Fluconazole is a triazole primarily fungistatic preventing the conversion of lanosterol to ergosterol, an essential component of the fungal cytoplasmic membrane. It is distinguished from the other azoles by its water solubility that results in excellent bioavailability by the oral route.

It is available as tablet or oral suspension. Doses of 5- 6mg/kg/ per day for 3-6 weeks can effectively treat TC^{22,41} (Grade of recommendation A; strength of evidence I b) Once weekly, 8mg/kg pulse dosing for 8-12 weeks is an alternative regimen⁴² (Grade of recommendation B; strength of evidence II a).

Evidence suggest that in respect to *Trichophyton* species TC, a 2-4 week regimen of fluconazole has similar cure rates to a 6 week of griseofulvin.²⁰

Two studies that included 140 children found similar cure rates between 2 to 4 weeks of fluconazole with 6 weeks of griseofulvin (RR 0.92; 95% CI 0.80 to 1.05).

Side effects of fluconazole are similar to other azole derivatives. Hematologic and hepatic toxicity may occasionally occur.

Drug interaction: terfenadine, cisapride (risk of serious cardiac arrhythmias)

Contraindications: severe liver disease. Use with caution in patients sensitive to other azoles.

Topical

Adjunctive topical therapies such as Selenium sulphide⁴³ (*Grade of recommendation B; strength of evidence II a*) or ketoconazole⁴⁴ (*Grade of recommendation B; strength of evidence III*) shampoos as well as fungicidal creams, or lotions⁴⁵ have been shown to decrease the carriage of viable spores responsible for the disease contagion and reinfection and may shorten the cure rate with oral antifungal. A terbinafine solution 0.01% completely killed arthroconidia of five *Trichophyton species* after an exposure time of 15–30 min. (*Grade of recommendation B; strength of evidence IIa*).⁴⁶

The topical fungicidal cream/ lotion should be applied to the lesions once daily for a week. (*Grade of recommendation C; strength of evidence IV*).⁴⁵

The shampoo should be applied to the scalp and hair for 5 minutes twice weekly for 2 - 4 weeks^{39,47} or three times weekly until the patient is clinically and mycologically cured.¹⁹ (*Grade of recommendation C; strength of evidence IV*). The latter in conjunction with one week of topical fungicidal cream or lotion application is recommended by the authors.

Additional measures

School attendance

Keeping children out of school after starting therapy is controversial. Several experts suggest that once treatment has been initiated with oral and topical agents, the children should, for practical reasons, be allowed back to school or day care although there is still a risk of infecting fellow students.²⁶ On the other hand, other experts recommend exemption from school/kindergarten attendance, regardless of the type of the dermatophyte, for approximately 2 weeks after initiation of treatment, a period necessary for significant decline of infection load in the hair follicle.⁴⁵

Patient education is, therefore, of utmost importance in eradicating tinea capitis.

It must be stressed that the degree of disease transmission depends on the type of the dermatophyte isolated, the most contagious being the ectothrix anthropophilic. The latter potentially spreads rapidly and often causes epidemics in schools.⁴⁸ Additionally, topical fungicidal treatment, nowadays, can kill arthroconidia rapidly.⁴⁶

Therefore, if the causative agent is an anthropophilic ectothrix the child should usually be allowed school /kindergarten attendance one week after initiation of treatment. Wood's light is useful to monitor the disappearance of contaminating spores. In all other cases the child should be allowed to attend school /kindergarten as soon as the treatment has been initiated.

When the child is back to school, he/she should be strongly advised not to share items such as combs, hairbrushes, scarves and hats, as fomites may play a role in transmission. School staff may help in enforcing this.

So, in all cases with TC caused by anthropophilic dermatophytes the school authorities should be notified.⁴⁸

Sports which lead to prolonged closed physical contact (e.g. wrestling) should be prohibited until the risk of infection no longer persists.

Sources of infection

On positive microscopy and pending culture clinical examination of family members is urgently recommended. Appropriate mycological samples should be initially taken only from those with signs of infection.

Zoophilic organisms such as *M. canis* cause an inflammatory response in nearly all those infected. On the contrary anthropophilic organisms, usually either *T tonsurans* or *T violaceum* cause a mild or non-inflammatory response thus making them good candidates for asymptomatic carriage.² Subsequently, if an anthropophilic organism is finally identified by culture in the index case, then appropriate culturing should be performed to all family members/ close contacts even in the absence of clinical signs (brush method). (*Grade of recommendation B; strength of evidence IV*) Close contacts include playmates in close physical contact and additionally, in youngest children (kindergarten through second grade) schoolmates, since these children are more susceptible and have a greater risk of disease transmission. (*Grade of recommendation C; strength of evidence IV*)

It remains unclear, whether carriers should be treated with topical antifungal shampoos or oral antifungals, with both or with neither. Those with moderate or heavy growth of culture, oral therapy may be justified as these individuals are particularly likely to develop an overt clinical infection; they are a reservoir of transmission and are unlikely to respond to topical treatment alone.

For those with low spore counts on culture, twice weekly selenium sulphide or 2% ketoconazole shampoo for up to 12 weeks is probably adequate³ (*Grade of recommendation B; strength of evidence IV*)

Pets (e.g. dogs, cats, guinea pigs, ham) should be also examined and treated as necessary.

It must be noted, however, that children in the Mediterranean countries are frequently infected by stray cats or dogs.

Viable fungal spores have been isolated from the floor, backs of chairs, clothing, beds, pillows, curtains, brushes, combs, scissors and other shared facilities in the household. Consequently the washable items (e.g. bedding and textiles) should be laundered, carpets should be vacuum cleaned, and floors mopped with a strong disinfectant. Brushes and combs as well as other hair accessories should be disinfected after use or discarded.³ The 2007 German-Speaking Mycological Society Guideline on TC noted that for items that can be boiled, e.g. combs or possibly hairbrushes, 5 min in boiling water is sufficient. Scissors may be placed in an instrument disinfectant e.g. 5 min in a Mucocit-B drill bath (this alcohol-based product is designed for disinfecting dental drills).⁴⁵

Steroids / antibiotics / antihistamines

Current data indicate that the use of steroids for kerion Celsi may reduce scaling and itching but does not reduce the clearance time compared with griseofulvin alone.^{49,50} (*Grade of recommendation A; strength of evidence Ib*). Prednisolone may be used as oral treatment at 1 mg/kg per day for 7-days though this is not recommended as part of routine care for kerion.⁵¹

Also, there are no studies that support the routine use of antibiotics in patients with kerion because kerion Celsi is rarely subject to secondary bacterial infection.⁵² Incision or excision of kerion nodules is not recommended.⁵³

In patients with pruritus, systemic antihistamines can reduce discomfort and may prevent distribution of spores via finger scratching.

Follow up

Clinical and mycologic examinations of the children should be conducted at regular intervals (2-4 weeks). The treatment may be stopped after the culture becomes negative *or* when hair regrowth is clinically evident, consequently the duration of treatment can be individualized according to the response.

The causes of treatment failure include suboptimal absorption of the medication, relative insensitivity of the organism, reinfection and lack of compliance with the long courses of treatment.

If at the end of the standard treatment period fungi can still be isolated from the lesional skin but clinical signs have improved, the recommendation is to continue the original regimen for another month. If there has been no clinical improvement then the original regimen can again be extended for a further month though in these cases it is also reasonable to switch to an alternative antifungal.

Assessment of renal, hepatic and hemopoietic function is suggested prior to beginning oral antifungal treatment (*Grade of recommendation C; strength of evidence IV*)

Periodic monitoring of hepatic enzymes and complete blood count is recommended in children during prolonged therapy with itraconazole or terbinafine (>4 and 6 weeks respectively).¹⁹ Additionally renal function should be monitored when the child is receiving prolonged treatment with griseofulvin or fluconazole.

Clinical appearances of Tinea Capitis

A: grey patch, B: moth eaten, C: Kerion, D: Black dot



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Appendix

Grading the evidence

Levels of Evidence

Ia: Evidence obtained from meta-analysis of randomised controlled trials

Ib: Evidence obtained from at least one randomised controlled trial

IIa: Evidence obtained from at least one well designed controlled study without randomisation

IIb: Evidence obtained from at least one other type of well designed quasi-experimental study

III: Evidence obtained from well designed non-experimental descriptive studies such as comparative studies, correlation studies, and case control studies

IV: Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities

Grading of Recommendations

A (Evidence levels Ia, Ib)

- Requires at least one randomised controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.

B (Evidence levels IIa, IIb, III)

- Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

C (Evidence level IV)

- Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality.

Table 1: Main aetiological agents of Tinea capitis in Europe

Species	Types
<i>Microsporum canis</i>	Zoophilic (e.g.cats, dogs) ectothrix
<i>Trichophyton tonsurans</i>	Anthropophilic, endothrix
<i>Microsporum audouinii</i>	Anthropophilic, ectothrix
<i>Trichophyton soudanense</i>	Anthropophilic, endothrix
<i>Trichophyton violaceum</i>	Anthropophilic, endothrix

Table 2: Clinical appearances of Tinea Capitis

Patterns	Description	Main aetiological agents
TC superficialis (Non inflammatory)		<i>T. tonsurans</i> <i>T. violaceum</i> <i>M. audouinii</i> <i>M. canis</i>
Diffuse scale	diffuse scaling with or without erythema, but no apparent hair loss	
Moth eaten	Patchy hair loss; the underlying scalp may be generally scaly	
Grey patch	a marked scaly, mildly erythematous patch with broken, lusterless hair	

Black dot	a patch of alopecia with prominent black dots (swollen stubs of broken off hairs)	
TC profunda (inflammatory form)		<i>T. verrucosum</i> <i>M. canis</i> <i>M. gypseum</i>
Agminate folliculitis	widespread scattered pustules	
Kerion Celsi	nodules, boggy swellings, discharging sinuses, alopecia, lymphadenopathy	
TC favosa (favus)	typical honey-colored, cup-shaped, follicular crusts and alopecia.	<i>T. schoenleinii</i> <i>T. verrucosum</i> <i>T. violaceum</i> <i>M. gypseum</i>

Table 3: Hair invasion of Dermatophytes

Site	Dermatophyte
Ectothrix	<i>M. audouinii</i> <i>M. canis</i> <i>M. ferrugineum</i> <i>T. mentagrophytes</i> <i>T. verrucosum</i>
Endothrix	<i>T. tonsurans</i> <i>T. violaceum</i> <i>T. soudanense</i>
Favic	<i>T. Schoenlenii</i>

Table 4. Dosing Regimens for the Treatment of Tinea Capitis

Antifungal agent	Dosage	Duration of treatment
Griseofulvin Microsize Ultramicrosize	20-25 mg/kg/ day 10- 15 mg/kg/ day	6-12 weeks or longer until fungal cultures are negative
Terbinafine	10-20 kg: 62.5 mg/day	<i>Trichophyton spp.:</i> 2-4

	20-40 kg: 125 mg/day >40 kg: 250 mg/day Or 4-5mg/kg/day	weeks <i>Microsporium spp.:</i> 8-12weeks
Itraconazole	Capsules:5 mg/kg/ day Oral solution:3 mg/kg/ day	Daily dosing: 2- 6 weeks Pulse regimen (1week with 2 weeks off between the first 2 pulses and 3 weeks between the 2 nd and 3 rd): 2-3pulses (range:1-5)
Fluconazole	Daily dosing: 5-6 mg/kg/ day Weekly dosing: 8 mg/kg once weekly	3-6 weeks 8-12 weeks