

## Monoterpenoids and Tetralin as Pediculocides

Sir,

The increasing resistance of head lice to established insecticides means that patients and parents are seeking alternative effective treatments (1). Essential oils, including tea tree oil and Biz Niz<sup>TM</sup>, are promoted as treatments for head lice by alternative medicine therapists. Tea tree oil is the essential oil steam distilled from the leaves and terminal branches of tea trees, in particular the Myrtle tree (*Melaleuca alternifolia*) (2). It is a complex mixture of over 100 hydrocarbons and terpenes. Of the 15 compounds found in highest concentration, 12 are monoterpenoids. These include terpinen-4-ol (30%), 1,8 cineole (15%), *p* cymene,  $\alpha$  pinene,  $\alpha$  terpinene,  $\alpha$  terpineol and  $\gamma$  terpinene (3).  $\alpha$  terpineol is also an insipient ingredient in some standard insecticide containing louse treatment lotions which are felt to be more effective (4). A 1% copper oleate shampoo (which also contains tetralin) has been shown to be an effective treatment in 1 clinical trial (5). We examined the potential pediculicidal activity of tea tree oil, copper oleate, tetralin, terpinen-4-ol,  $\alpha$  terpineol and  $\gamma$  terpinene, using *in vitro* exposure tests with freshly collected live adult head lice.

### MATERIAL AND METHODS

Neat tea tree oil, tetralin,  $\gamma$  terpinene,  $\alpha$  terpineol and terpinen-4-ol were diluted to 1% and 10% solutions in isopropanol. Copper oleate crystals were created by combining copper sulphate and potassium oleate according to Nelson & Pink (6) and, from this, 1% and 10% aqueous solutions were made. All products were obtained from Sigma-Aldrich Co. Ltd (Poole, Dorset, UK). Chemical-impregnated filter papers were made by dipping Whatman no. 1 cellulose filter papers, 5 cm in diameter, into the various solutions. The filter papers were dried and stored at 4°C in the dark in air-tight containers and used within 24 h. Live adult head lice were collected off school children (aged 4–11 years) from 3 primary schools using a fine-toothed louse detector comb. Consent for collecting lice was obtained from the South & West research ethics committee, school head-teachers and the pupil's parents. Lice were pooled together to provide sufficient test numbers. The lice were stored in a portable incubator set at 30°C and 70% relative humidity (the optimum lice survival conditions) (7) and used in the *in vitro* test within 2 h of collection. The lice were exposed (10 per filter paper) to the various impregnated filter papers as well as unimpregnated filter papers and assessed after 2 h. Mortality was judged as the absence of all internal and external movement on tactile stimulation.

### RESULTS

The results are shown in Table I. Compared with controls, there was a significant mortality for all chemicals tested, except copper oleate ( $p < 10^{-8}$ , Fisher's exact test). Lice were either dead or seemingly unaffected, except for  $\gamma$  terpinene exposed head lice, which showed hyperexcitability, increased abdominal contractions and uncoordinated movements at 1% exposure.

### DISCUSSION

The mechanism of action of these compounds is not known; however, some monoterpenoids and tetralin derivatives do have neurotoxic effects (8, 9). Increasing the concentration of

Table I. Mortality of head lice on exposure to potential insecticides

Insecticide	Dead	Alive
Tea tree oil		
10%	70	11
1%	0	50
$\gamma$ Terpinene		
10%	35	26
1%	0	81
Tetralin		
10%	50	0
1%	26	75
Copper oleate		
10%	0	40
1%	0	43
Terpinen-4-ol		
10%	80	0
1%	23	65
$\alpha$ Terpineol		
10%	70	0
1%	20	72
Controls	0	80

monoterpenoids or tetralin in existing pediculocides might improve insecticidal activity, but may also increase the number of reported cases of contact dermatitis or symptoms of overdose. Further laboratory work is needed in order to establish dose mortality curves and long-term safety data before these chemicals can be assessed using clinical trials. The promotion of commercially available essential oils as treatments for head lice should be discouraged until more data is available.

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A.M.R. Downs<sup>1</sup>, K.A. Stafford<sup>2</sup> and G.C. Coles<sup>2</sup>  
Departments of <sup>1</sup>Dermatology and <sup>2</sup>Clinical Veterinary Science,  
University of Bristol, Bristol, BS2 8HW, UK.

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## Treatment of Eosinophilic Annular Erythema with Chloroquine

Sir,

Figurate or gyrate erythemas include a variety of dermatoses characterized clinically by annular and polycyclic erythemas or plaques with a tendency to centrifugal extension and central healing. In most cases the aetiology remains unknown and elimination of the cause is then not possible. In some cases spontaneous remission of the different types of gyrate erythemas has been observed (1).

Several drugs have been used previously for the treatment of gyrate erythemas, in particular systemic steroids (2). In most cases, there is a poor response or lesions recur after discontinuation of treatment. Recently, chloroquine has been used as an alternative drug in the treatment of figurate erythemas. Frank et al. (3) observed a patient with erythema annulare centrifugum who showed a good response to chloroquine and hydroxychloroquine with disappearance of skin lesions and no recurrence.

Figurate erythemas with conspicuous tissue eosinophilia have only been reported in children (1, 4). We observed a patient with recurrent annular erythemas, histologically presenting as eosinophilic dermatosis of 9 years' duration; an entity that has to our knowledge not yet been reported in adults. This dermatosis responded only temporarily to corticosteroids, but resolved promptly after treatment with chloroquine.

### CASE REPORT

A 62-year-old woman had suffered from recurrent itchy urticarial papules and annular erythemas up to 10 cm in diameter on the trunk and extremities for 9 years starting in 1989 (Fig. 1). At first presentation, the annular erythemas were slightly scaling. There was a history of thyroiditis and thyreostatic treatment 10 years previously. She had not been taking any drugs during that time. Several laboratory and clinical work-ups were done in that period and revealed normal laboratory data and blood chemistry including eosinophil count, except for an elevated white blood cell count of 11300/mm<sup>3</sup>. Antinuclear antibodies and subsets, electrophoresis and immunoelectrophoresis were normal. At the latest examination in 1997 IgG antibodies against *Borrelia burgdorferi* were (+++) positive as well as anti-thyreoglobulin antibodies with euthyrotic function. Chest X-ray, gynaecological, urological, throat, nose and ear examination, as well as an abdominal ultrasound investigation, were normal. A gastroscopy showed erosions in the antrum (*Helicobacter pylori* negative); furthermore, chronic tonsillitis was diagnosed. Six biopsies, taken at regular intervals during the 9 years, showed a dense superficial and deep perivascular lymphohistiocytic infiltrate in the dermis with abundant eosinophils throughout the dermis, and a normal epidermis and subcutis (Fig. 2). Direct immunofluorescence from one of the biopsies was negative. A T- and B-cell rearrangement to rule out malignant lymphoma performed

on the latest skin biopsy in December 1997 showed a polyclonal proliferation.

The patient was treated repeatedly with local and systemic corticosteroids with only moderate success or short symptom-free periods.

Due to high IgG antibodies against *Borrelia burgdorferi* in 1997, a skin biopsy was cultured for *B. burgdorferi* but was negative. Nevertheless, the patient was treated with ceftriaxone 2 g/day intravenously for 3 weeks and topical steroids in January 1998. The dermatosis improved slightly, but there was a complete recurrence 3 weeks later. A therapeutic trial with dapson initiated 4 weeks after treatment with ceftriaxone had to be discontinued after 6 weeks due to vertigo and lack of response. In May 1998, the patient was put on chloroquine 250 mg/day. After 2 weeks there was complete resolution of skin lesions and chloroquine was discontinued after 1 month. Nine months later, the patient was still free of symptoms.



Fig. 1. Several annular plaques on the forearms with central clearing.