

MEASURING INSECTICIDE RESISTANCE IN HUMAN HEAD LICE, *PEDICULUS CAPITIS* (ANOPLURA: PEDICULIDAE)

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During the early 1990s the Medical Entomology Centre, Cambridge, received an increasing number of reports from concerned health professionals of treatments against head lice failing to cure. Preliminary investigations showed some lice to have developed tolerance of pyrethroid insecticides. A series of enquiries from other districts prompted us to set up a service to test lice from patients purported to have suffered long term infections that did not respond to treatment.

The test devised was based on the World Health Organization method for evaluation of susceptibility or resistance in lice but used test papers made in the Centre's laboratory. Head lice, collected from patients in the afternoon, are sent by mail to arrive the next morning. On arrival the insects are fed and transferred to appropriate insecticide impregnated papers. The insects are incubated and observed at 15-20 minute intervals for signs of stress or intoxication. Different insecticides induce distinctively different symptoms of intoxication so individual criteria have been established to determine an end point for each insecticide test.

A major problem of the procedure is the high mortality of insects in transit, despite shipping in humidified containers, so a test kit has been devised to enable field workers to perform tests themselves.

The basic test kit consists of one each of four pre-treated filter paper discs in plastic Petri dishes: 1% permethrin (also tests *d*-phenothrin), 5% malathion, 1% carbaryl and a control with solvent only (0.7% pyrethrum synergized with 7% piperonyl butoxide and 1% *d*-phenothrin are currently available as additional/alternative options); observation recording sheets and sample *log*-probit graphs for baseline results, obtained using susceptible lice. The only additional pieces of equipment required are a plastic food box, paper towels, timer, magnifier, plastic head louse detection comb, a room type thermometer to monitor the temperature in the box and a source of warmth to 30° Celsius.

Throughout its development the purpose of the procedure has been to determine:

- whether resistance exists in the louse population or there has merely been treatment failure
- the level of any resistance in dosage terms
- the distribution of resistance in proportion to the louse population.

Such knowledge is important for confirming whether pediculicides in current use are likely to be effective in a given area. Where resistance has been identified, efforts have been made to inform the relevant authorities with the aim of developing an appropriate clinical management programme.