COMPARATIVE EFFICACY OF *d*-PHENOTHRIN AND MALATHION IN THE CONTROL OF PEDICULOSIS

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ABSTRACT

A study was conducted in a semi-urban community of Pune for estimating the prevalence of pediculosis (head lice) and evaluating the relative efficacy of *d*-phenothrin and malathion. A total of 729 subjects from the community and 126 school children were included in the study. A prevalence of 69 per cent in the community and 54 per cent in school children was found. *d*-phenothrin had a better pediculicidal (84%) and ovicidal (62%) activity as compared to malathion (82% pediculicidal and 40% ovicidal activity).

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KEY WORDS : Pediculosis; *d*-phenothrin; Malathion.

Introduction

Infestation with *Pediculus humanus capitis* has been associated with large populations throughout the world resulting in physical symptoms and social embarrassment to the affected. The problem has been aggravated due to over-crowding caused by the rapid industrialization and urbanization leading to deterioration in living standards. The school-going children and the adolescents form the most vulnerable population for pediculosis which affects their health so also their curricular and extracurricular activities. Efforts have since been made to provide an effective control of pediculosis. The earlier control measures revolved round personal hygiene and chemical control with the organochlorines - DDT and Lindane. The development of resistance in head lice to organochlorines [1,2] necessitated the alternative use of an organophosphate (malathion). Malathion provided an effective control till the advent of more potent and safer insecticides - the synthetic pyrethroids. In this study the differential efficacy of synthetic pyrethroid *d*-phenothrin vis-a-vis malathion for the control of head louse infestation has been tested.

Material and Methods

The study included the population of a semi-ur-

ban community of Pune comprising lower socio-economic group. A primary school functioning in the same area was also included in the study. A total of 729 subjects from the community and 126 school children of 7 to 11 years age were considered for determining the prevalence of head louse infestation. All were subjected to a thorough search of the scalp for head louse infestation by using a chinese comb and magnifying glass. Any person harbouring at least one live adult or nymph during a 5 minute search was labelled a case of pediculosis. Based on this data prevalence rate of *P. humanus capitis* infestation was determined for both groups. For insecticidal trial only those children from whom at least 5 adults or nymphs were recovered in 5 combings were considered. The subjects were randomly allocated into three groups i.e. A, B, and C. Group 'A' was given *d*-phenothrin treatment, group 'B' was treated with malathion and group 'C' formed the control group.

GROUP 'A'

Application involved wetting of the hair followed by a thorough massage with shampoo containing 0.23 per cent *d*-phenothrin and subsequent washing of the hair. The shampoo was massaged for different time periods of 5, 15, 30 and 60 minutes to evaluate the most effective application time. The observations were recorded on 7th post-

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treatment day in terms of pediculicidal and ovicidal activity. Most effective time period was determined and the subjects of this group were given replicative treatment with the insecticidal shampoo till approximately cent percent efficacy was achieved. Treated hair samples with adults were also taken and observed in laboratory for 100 per cent mortality.

GROUP 'B'

Application technique for malathion 0.5 per cent was the same as in case of *d*-phenothrin, except that the subjects were asked to leave the chemical overnight instead of variable time intervals. Observations were recorded weekly with subjects receiving replicated treatments at the end of each week till nearly 100 per cent efficacy was achieved. The hair samples along with adults were taken from the treated subjects for laboratory study to determine the time period required for 100 per cent mortality.

GROUP 'C'

In control group, infestation was recorded at the end of each week without insecticidal application. They were allowed to wash hair in usual manner.

Results

Prevalence of head louse infection in the community and school children is presented in Table 1. Out of the 729 subjects from the community 503 (69%) were found to be positive for head louse infestation, whereas among 126 school children surveyed 68 children (54%) were positive for infestation. All the school children positive were found to be heavily infested and hence all 68 children were included in the study.

TABLE 1
Distribution of head louse infestation

Study group	Total subjects	No infested with head louse	% infestation
Community	729	503	68.99
School children	126	68	53.96
Total	855	571	66.78

The differential efficacy on first application with malathion and *d*-phenothrin is presented in

Table 2. The effect of *d*-phenothrin on adult lice was found to be significant ($p < 0.05$) between 5 and 15 minutes application time. However, the differential effect between application time of 15, 30 and 60 minutes was not found to be statistically significant ($p > 0.05$). Effect on nits is significantly higher at 15 minutes application time as compared to 5 minutes application time ($p < 0.05$). However, the difference between 30 and 60 minutes application time was not statistically significant ($p > 0.05$).

TABLE 2

Percent efficacy of *d*-phenothrin and malnutrition on first application

Activity	<i>d</i> -phenothrin				Malathion overnight application
	05 min	15 min	30 min	60 min	
Pediculicidal	42	72	84	85	82
Ovicidal	25	50	62	69	40

Pediculicidal activity of *d*-phenothrin at 30 and 60 minutes exposure time is comparable to that of malathion as overnight application. However malathion exhibits a poor ovicidal activity [3] compared to *d*-phenothrin at these two exposure periods.

The results on repeated application with both the chemicals are presented in Table 3. A nearly cent per cent pediculicidal activity on two applications with both the chemicals is observed. The ovicidal activity of malathion was, however, poor as compared to *d*-phenothrin after two and three applications.

TABLE 3

Percent efficacy of *d*-phenothrin and malathion on repeated application

No of application	% Activity			
	Pediculicidal		Ovicidal	
	<i>d</i> -phenothrin	Malathion	<i>d</i> -phenothrin	Malathion
One	84.00	82.00	62.00	40.00
Two	100.00	99.00	93.00	73.00
Three	100.00	100.00	98.00	75.00

In the control group, the weekly recording of infestation indicated no change in infestation rate,

with minimum recovery of 5 nymphs or adult over the period of study. The same degree of infestation was present before the commencement of the study.

Discussion

A prevalence rate of 54 per cent head louse infestation among school children in this study, compares well with the prevalence rate of 50-60 per cent of head lice infestation among French school children [4].

The data on *d*-phenothrin treatment indicates an optimum pediculicidal and ovicidal activity at 30 minutes exposure and beyond. Hence a contact period of 30 minutes is considered ideal for achieving the maximum efficacy. The efficacy results with *d*-phenothrin and malathion in our study do not compare well with the findings of other workers [5]. The pediculicidal activity of malathion and *d*-phenothrin as observed in this study is 82 and 84 per cent respectively whereas Chosidow et al report 95 per cent and 39 per cent pediculicidal activity for malathion and *d*-phenothrin respectively [5]. This difference is due to the acquired resistance to *d*-phenothrin in France as reported in the above quoted study.

The ovicidal activity of 40 per cent in the case of malathion treatment in this study compares well with the ovicidal activity of 42 per cent with gel

formulation of malathion as reported in Israel [6]. The laboratory study undertaken to assess the pediculicidal activity of adults treated with malathion and *d*-phenothrin revealed 100 per cent mortality within 24 hours post treatment [7].

Based on the findings of this study it is recommended that two applications with *d*-phenothrin at weekly interval should be undertaken to achieve optimum lice disinfestation.

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