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SELF CARE OF HEAD LOUSE INFESTATION

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ABSTRACT

Treatment of head louse infestation is primarily a family affair. However, until products became available for self medication it was fraught with difficulty. The introduction of neurotoxic insecticides was not a lasting solution as head lice rapidly developed resistance to one active substance after another. Additionally the evaluation of treatments was generally poor until quite recently, which allowed some products that were ineffective to be sold, with the increased risk that resistance would follow. A recently published evaluation of an oral treatment, ivermectin, showed high efficacy but use of this insecticide is likely to be restricted for regulatory reasons. It is now the case that conventional insecticide treatments are disappearing in favour of materials of natural origin and physically acting chemicals. The former are often difficult to characterise, and most are likely to suffer the same fate as insecticides. The latter are increasing in use and popularity but still require careful application, even if development of resistance is not likely to emerge as a problem.

There is also a renewed interest in combing for treatment, which suits some people but appears to be beyond the ability of others. Fundamental to all treatment is being able to diagnose an infestation at the earliest stages. Evidence shows that using appropriate diagnostic combs is the best method for this.

This review assesses the strengths and weaknesses of the available treatment options to guide health care professionals advising consumers on the self-care of head lice infestation.

Key words: head lice, pediculosis, insecticide, resistance, oral ivermectin, essential oils, physically acting treatments

INTRODUCTION

Throughout history, management of head louse infestation has almost always been a process of self care. In general, professional interventions have been reserved for dealing with extreme circumstances, to assist those with some impairment, or in attempts to solve a problem found to be intractable when commitment to self-care was lacking. This does not mean that self care is a straightforward option or a simple process. For many, dealing with head lice has proven a nightmare struggle, even with professional support and input.

It is a popular myth that this difficulty is a new phenomenon and that in the "old days" head lice were more manageable. However, references to the management of head lice in older literature clearly demonstrate the opposite. For example, an attempt to eliminate head lice from the public schools in late 19th century Boston was frustrated by carers' inability to comb out head louse eggs, and by the lengths to which some would go to excuse themselves from

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this onerous task[1]. Nevertheless, control of head lice has traditionally relied on combing and in many parts of the world this remains the mainstay of head louse control to this day. Given the option, however, most parents and carers would choose to use the quicker and simpler alternative of a chemical treatment to eliminate the parasites.

THE INTRODUCTION OF INSECTICIDES

Widespread use of insecticides to control head lice began in the 1940s. This was initially a measure designed to eliminate high levels of infestation discovered in children evacuated from wartime London and other large cities[2]. The treatment was Lethane 384 hair oil, a mixture containing N-butyl carbitol thiocyanate and beta-thiocyanoethyl laurate in refined paraffin, which showed moderate efficacy in controlled studies[3]. However, it was considered impossible for authorities to manage the problem and strategies were devised to encourage families to self-treat by recommending the treatment as a "hair tonic", in case mentioning they were "lousy" caused offence[4]. The relative infectiveness of Lethane, and the then recently discovered activity of DDT (dichloro diphenyl trichloroethane), meant that the latter soon became the treatment of choice for health professionals. But as consumer products were not widely available for a further decade or more, combing remained the basis of head louse control in the family.

Consumer products were initially classed as cosmetics in most countries, so no specific studies of efficacy were conducted. It was only when loss of efficacy indicated the appearance of resistance in the UK that shampoos based on hexachlorocyclohexane (HCH or lindane) were evaluated clinically, in this case in comparison with the newly introduced 0.5% malathion lotion (Prioderm® lotion)[5]. Even at this stage (early 1970's) the majority of treatments administered in the community in the UK, and some other European countries, were applied by school health service staff. It was not until school head inspections and school clinic supply of treatments ended that self-care of head lice in the family truly began. The need for families to acquire their own treatments started earlier in the US. However, there the diagnostic aspect delivered by the school nurse continues to this day, although it is now recognised in professional circles that policies need changing and that both diagnosis and treatment of infestation require independent management at the family level[6].

During the 1970s, as more products became available for consumer use, there was an increase in the number of published investigations comparing the efficacy of alternative formulations and products. But overall the quality of the evidence generated was poor and most studies were inadequately controlled and badly designed[7-11]. In addition, because regulatory control of products was limited, if a product contained the same concentration of insecticide as one already marketed, irrespective of important differences in formulation, there was no requirement for independent testing, with the consequence that some largely ineffective products were marketed[12-14]. Overall during this period the most popular consumer products in all countries were shampoos, mainly because they offered what some considered the simplest application method and least disruption of family routine for the majority[15]. However, this type of product is least likely to demonstrate adequate efficacy, due to dilution in use, low dose application

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rates, and short contact time[14,16]. Nonetheless the use of shampoos for head lice is still popular in both Europe and North America, as discussed later.

INSECTICIDES IN THE TREATMENT OF HEAD LICE

Decade	Insecticide Preparation
1940s	Lethane 384 Hair Oil (N-butyl carbitol thiocyanate and beta-thiocyanoethyl laurate in paraffin) (UK Local authorities then consumer) DDT (UK, Europe local authorities then consumer) Lindane (UK Local authorities)
1960s	DDT (Europe consumer) Lindane shampoo(UK, Europe consumer)
1970s	0.5% Malathion lotion (UK, Netherlands, France, Australia consumer) Lindane shampoo (US prescription only) Synergised Pyrethrum shampoo (US, Europe, Australia consumer) 0.5% carbaril lotion (UK consumer)
1980s	1% Permethrin crème rinse (US prescription only) d-Phenothrin shampoo, lotion (France consumer) 0.5% Malathion lotion (US prescription)
1990s	d-Phenothrin shampoo, lotion, liquid (UK consumer) 1% Permethrin crème rinse (consumer US and worldwide) 1% carbaril liquid (UK consumer, later prescription)
2000s	0.5% Malathion gel (US prescription)
2010	Oral ivermectin 400µg/kg. Not approved.

Development of a new type of pediculicide, 1% permethrin crème rinse (Nix® crème rinse, Lyclear® crème rinse), in the mid 1980s resulted in the first comprehensive body of evidence for efficacy of any treatment product. Initial trials conducted in Panama demonstrated a high level of efficacy in comparison with lindane shampoo (Kwell® shampoo) but did indicate that around 30% of louse eggs were likely to mature and hatch. These were only prevented from re-establishing infestation by permethrin trapped in the matrix of the louse eggshell's cap, so that when the louse nymph began to emerge it was killed on contact with this residual insecticide[17]. Subsequent comparative trials recruited participants from the US and Central America. They showed 1% permethrin crème rinse to be significantly superior to both 1% lindane shampoo[18,19] and 0.3% synergised pyrethrum shampoo (Rid® shampoo)[20,21]; respectively the leading prescription and over the counter remedies available in the US at the time. Despite being restricted to prescription-only supply throughout the 1980s, 1% permethrin crème rinse was soon after converted to over the counter availability in the US, and was rolled out into other territories around 1991. It became the most used product in the world, captured about one third of the US market, and engendered a host of "copy-cat" products in territories as far apart as Australia, South America, and Israel.

THE EMERGENCE OF RESISTANCE

The quality of evidence generated for 1% permethrin crème rinse was considerably superior to that of any product previously, but was not emulated in several studies conducted to support

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a cluster of *d*-phenothrin based products (Full Marks® shampoo, lotion, liquid) produced in the UK[22-27]. However, from about 2 years after widespread introduction of permethrin and phenothrin, there were numerous reports that these products failed to cure. Subsequently the problem was shown to be due to "knockdown" resistance (*kdr*), mediated by a point mutation in the *para*-orthologous voltage sensitive sodium ion channel α -subunit gene of the head louse, originally selected for by DDT use in the 1960s. The problem was first identified in Europe[28-30] and Israel[31] and subsequently documented in Argentina[32] followed by the US[33, 34], a sequence that reflected how much it was looked for, rather than relative prevalence. Nevertheless, in 1995, the first systematic review of head louse treatments was published and was widely interpreted as unequivocally demonstrating that the only extant treatment for which adequate evidence of efficacy existed was 1% permethrin crème rinse, based on two studies conducted 10 years previously[35]. This resulted in many primary care practitioners doggedly continuing to prescribe the product despite the evidence of resistance identifiable through repeated treatment failures in their patients.

What confused the picture for clinicians and public alike was that permethrin continued to be effective in one community but not another. So in some studies nearly all lice examined proved to be resistant[36] whereas in others efficacy of treatment was still sufficiently high that it could be considered acceptable[37]. However, the appearance of resistance to malathion and other acetylcholine esterase-inhibiting insecticides within another 5 years[38-40] (subsequently demonstrated to be from non-specific esterase enzymes that produced a double resistance with permethrin[39, 41]), meant the development of new types of treatment was long overdue.

THE RE-INVENTION OF TREATMENT COMBING

One alternative treatment that had always remained an option was combing. Even before the first confirmation of resistance to malathion or pyrethroid insecticides, a fresh approach to combing was offered in the form of wet combing, with conditioner as a lubricant, under the branding "Bug-busting"[42]. The approach was based on systematic combing to remove all mobile stages of lice at intervals of about 3 days. Over a period of approximately 2 weeks, all eggs would hatch and the nymphal lice emerging from them would be physically removed from the head before they were able to develop to adulthood, and lay more eggs. The process is simple in principle but does require some skill and commitment. The materials used in the kits have changed over time so it is difficult to compare the outcomes from them, but in four studies conducted pragmatically (the carers performed the treatment rather than investigators), the outcome ranged from 23% to 57% success after 14 days. At the top end this compares favourably with insecticides affected by resistance[43-46]. However, the fact that combing can have a limited effect, even in the hands of trained investigators, was demonstrated in a comparison of 1% permethin rinse with and without combing, in which the group with additional combing showed no improvement over the uncombed group in terms of treatment outcome over 2 weeks[37].

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INSECTICIDES TODAY

Irrespective of how effective combing might or might not be, a high proportion of people still choose to use a chemical treatment for elimination of head lice. In some parts of the world, insecticides severely affected by resistance elsewhere are still effective. For example, in the US, malathion (Ovide® lotion) is not only still considered the most effective treatment but it has also been demonstrated effective using a shorter application time if incorporated into a gel rather than a lotion vehicle[47,48]. However, if the preparation moves from prescription to over the counter it is sure to suffer the same fate as malathion in Europe, simply because extensive use will eventually lead to cases of inadequate dosing by consumers, and result in the selection of resistant head lice.

It has been suggested that alternative neurotoxic agents with a different mode of action or target site could be used in those places where resistance has arisen[49-50]. But most candidate materials such a fipronil and imidacloprid either have problematic toxicology profiles or are too valuable for the manufacturers as veterinary treatments for them to venture into the uncertain territory of the highly regulated human medicines market. One possible alternative insecticide is oral ivermectin (Stromectol®), for which evidence of activity against head lice co-exists with extensive prior use in treating other human parasites (scabies - *Sarcoptes scabiei* and onchocerciasis – the cause of river blindness in Sub-Saharan Africa). As with other treatments, this insecticide should be given twice, with a 7 day interval, to ensure emerging nymphs are eliminated after hatching. In a new double-blind multi-centre study of 812 people (mainly children), who had all recently experienced treatment failure with conventional insecticides, oral ivermectin 400µg/kg produced 95.2% elimination of infestation and a significant ($p < 0.001$, 95% CI 4.6 to 15.7) advantage over malathion lotion after 14 days, with an excellent first dose elimination rate of 83.6%[51]. In this study 0.5% malathion lotion (85.0% success at 14 days) performed better than in any other recent trial, possibly because some of the study sites in Ireland, Israel, and Wales have not previously reported resistance to malathion in their local populations. Additionally, treatments were supervised by study staff and therefore lotion application instructions were closely adhered to. Ivermectin is not currently licensed for use in head lice infestations in any country although it is approved for scabies treatment in some European countries and the US. Any 'off label' use is likely to be reserved for cases where resistance to other treatments has made head lice elimination particularly difficult. However, because it is ingested in a body mass dependent dose, it is likely to give more reliable treatment than topical treatments which are highly susceptible to application errors and under-dosing. Nevertheless, despite its distinctive efficacy and convenience this product may not be widely used, partly because of its regulatory status and partly because newer physically-acting treatments, unaffected by insecticide

INSECTICIDE RESISTANCE: POINTS TO CONSIDER

Resistance to topically applied insecticides is inevitable and depends on volume and patterns of use.
Factors that promote the selection of resistance include: **inadequate dose (e.g. due to dilution)** **inadequate application (thick or long hair)** **inadequate contact time**
Shampoo insecticide formulations are particularly likely to promote resistance because of their mode of application
Resistance (and compromised efficacy) may be high in one country/region and low in another

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resistance, are already available as over the counter products and Class I medical devices.

NON-INSECTICIDE TREATMENTS: ESSENTIAL AND FIXED OILS

Since the appearance of resistance to the most used insecticide preparations, there has been a trend in some countries for consumers to abandon use of neurotoxic insecticides in favour of natural and herbal preparations. Many of these 'alternative' products make no direct claims of efficacy, have not been tested for efficacy or safety, and are sold mainly through the internet or via alternative lifestyle outlets. However, some formulations with a natural products basis have become regulated products via the medical device route. Among these are preparations based on essential oils, fixed oils, or a combination of the two. Unfortunately many of the studies describing these products do not provide adequate clinical evidence of their efficacy or safety because they are often too small, uncontrolled or inadequately controlled, and give poor descriptions of methodology and outcomes.

Two products based on essential oils have been described. A spray in which oil of anise is combined with modified coconut oil (Chik-Chak® spray, ParaNix® spray, Lyclear® spray away) has been evaluated in three studies. In the first it was applied on three occasions over 10 days, in comparison with an aerosol spray containing malathion and synergised permethrin (Para-plus® lice spray), but the dropout rate was nearly 10% of enrolled participants[52]. The second enrolled only 12 people[53]. More recently, a comparison between the anise and coconut spray, and 0.5% permethrin lotion (InfectoPedicul® lotion), each applied twice in 100 participants, found a significant ($p < 0.0001$ 95% CI 22.5% to 57.5%) advantage in efficacy for the spray (82% success), although 33 people across both groups experienced stinging and scalp irritation due to alcohol and/or essential oil in contact with excoriated skin[54]. The other essential oil product contained 10% eucalyptus oil in a lotion base (Moov™ head lice solution). Of 152 children enrolled in a study to compare this product with malathion foam (KP24 medicated foam) and pyrethrum mousse (Banlice® mousse), 39 (25.7%) dropped out or were non-compliant, and although 33/40 (82.5%) of those completing the study from the eucalyptus group were cured, 18 (45.0%) experienced stinging adverse events[55]. Evidence from these studies indicates, not surprisingly, that essential oils at therapeutic concentrations may cause skin irritation during treatment, a feature they share with the alcohol and terpenoid based lotions of malathion introduced in the early 1970s[7,8,10,12,13,16], but bizarrely never reported at the time.

There is little information on efficacy of the wide range of products based on fixed vegetable oils or other herbal extracts. Several have been available for more than a decade without adequate evaluation and only recently have some been subjected to even *in vitro* testing[56-59]. These studies, some of which evaluated essential oil based materials in parallel, suggest that direct activity of the fixed oil or essential oil component of several of the products against lice is relatively limited. As most of the products containing fixed oils are shampoo based, one route of activity would be from the surfactants in the shampoo disrupting the louse cuticular lipid, which would ultimately result in its death from dehydration. The limited clinical investigations are also unclear in methodology, so it is possible that at least some of the reported high level

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of efficacy (believed to be >80% but the endpoints and outcomes were not clear) for a shampoo containing neem oil (Wash-Away Louse™ shampoo), was due to combing immediately after washing with the shampoo[60], and this may also be the case for a different shampoo containing a non-essential oil extract of grapefruit[61].

The reason many people may choose to use a product containing active components of natural origin is because they believe the ingredients are safe. Irritation due to the rubifacient effect of essential oils has already been noted, but many of these compounds have additional pharmacological effects on humans. Some essential oils have been implicated in inducing pre-pubertal gynaecomastia in boys after relatively limited exposure[62]. Other compounds, particularly enzymes incorporated into shampoo vehicles, caused severe ocular irritation (Lice R Gone®)[63], which led to corneal abrasions.

NON-INSECTICIDE TREATMENTS: SYNTHETIC OILS

Many people simply desire some degree of certainty in the outcome of head lice treatment and for them some of the newer products based on synthetic oils may offer the best options. Mineral oils were always considered as potential head louse treatments, but most materials, like liquid paraffin, have limited activity against lice and often none against louse eggs because they have a moderately high surface tension, medium viscosity, and limited capacity to "wet" the cuticular lipid of the insects. However, recently developed silicone oils have an extremely low surface tension, a wide range of available viscosity, and also show reasonably good wetting characteristics. The result has been the development of a variety of products that have exhibited high levels of efficacy in clinical studies.

Siloxanes (silicone fluids) have been investigated at various times for their activity against insects. Many of these materials are unsuited to use as head louse treatments and some preparations have had important cosmetic disadvantages. Currently three silicone based products have been evaluated for efficacy, safety, and acceptability and are currently marketed in several countries in Europe, and/or in the process of being registered elsewhere.

One of these products is a combination of the volatile siloxane cyclomethicone and the fatty acid ester isopropyl myristate in equal proportions (Full Marks® solution, Resultz™). It was initially investigated for activity in Canada and in the US in comparison with an over the counter pyrethrum shampoo (Rid® shampoo)[64]. In the initial proof of concept study 28/29 (96.6%) of treatments were successful, but in the comparative study only 57% were successful. However, the actual outcomes and the relevance of these findings to consumer use were almost impossible to evaluate, due to the complex and confusing manner in which the studies were conducted and presented. The fact that the participants were combed out using a plastic nit comb immediately following treatment makes it even harder to determine whether the tested product was effective[64]. A different pair of studies conducted in the UK compared the product with 1% permethrin crème rinse[65]. In both trials the isopropyl myristate preparation exhibited

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superior activity using a 10 minutes treatment applied twice 7 days apart, so that analysed together, 91/111 (82%) were successfully treated with isopropyl miristate compared with 11/57 (19.3%) for permethrin ($p < 0.001$, 95% CI 50.2% to 75.2%).

Of the siloxane-based preparations it is those made almost entirely of silicones that have had the greatest impact in improving therapeutic options. The first product in this category to be developed (Hedrin®, EtoPril®, Pouxit® lotions) contained 4% high molecular weight dimeticone dissolved in cyclomethicone (decamethylcylcopentasiloxane). Initial studies showed a success rate of 89/127 (70.0%) for dimeticone compared with 94/125 (75.0%) for a phenothrin liquid (Full Marks® liquid) (difference -5%, 95% CI -16% to 6%) with both products applied twice 7 days apart[66]. A second study of the same 4% dimeticone product found it to be superior to 0.5% malathion (Derbac-M® liquid) with 30/43 (69.8%) success for dimeticone and 10/30 (33.3%) for malathion ($p < 0.01$, 95% CI 14.7% to 58.2%)[67]. The physical mode of action enables 4% dimeticone to kill lice resistant to conventional insecticides. This is achieved by the extreme mobility of the cyclomethicone solvent that carries highly viscous dimeticone into the spiracles and outer part of the tracheae of the louse, where it effectively blocks the respiratory tract. The result is that lice coated with dimeticone are prevented from excreting the water ingested when they feed on blood[67]. Another preparation, made from two low molecular weight dimeticones with some essential oils added (Nyda® L), exhibits a similar activity. A study comparing it with 1% permethrin lotion (Kwell® lotion) found a success rate of 70/73 (95.9%) for dimeticone compared with 48/72 (66.7%) for permethrin ($p < 0.0001$; RR 1.44, 95% CI 1.22 to 1.70)[68]. However, assessments were only conducted until the ninth day so these results are likely to be optimistic. Additionally the investigators used wet combing with conditioner as their diagnostic tool so it is possible that this may have had an influence on outcome.

PREVENTING AND DETECTING LICE INFESTATION

Traumatised by the difficulty of treating infestations, many consumers wish for products that will prevent lice from returning. Claims of residual action have been made in the past, although in some cases these were the result of misinterpretation of observations, and all were of limited duration[5,7,17]. The other major disadvantage of 'prevention' through residual activity is that it slowly wears off when subjected to hair washing and conditioning. Eventually a sub-lethal concentration of insecticide remains on the hair, and when insects survive the encounter, this is the first stage for selection of resistant strains of lice.

It is possible that products could be developed that would repel head lice in the same way as mosquitoes are deterred from biting. However, unlike mosquitoes, lice do not seek their hosts by smell, and move from one host to another in response to physical stimuli[69]. This makes repelling a louse a much more uncertain process. It has been postulated that simple use of heavy fixed oils as hair dressings has a repellent effect[56], but a physical deterrent is not a true repellent. Also in some cases the oils used, such as sassafras or coconut, may actually kill lice in contact with them, either by coating and asphyxiating them or, in the case of

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sassafras, through active chemical components like 1-naphthol, which is highly toxic for lice and humans alike.

True 'repellency' is due to a chemical residue or vapour causing a change in behaviour without killing the insects. Some materials, such as some essential oils[70] and piperonal[71,72] have been shown to have this effect *in vitro*. However, demonstration of these effects clinically is somewhat more difficult. One study of an essential oil based product found a significant difference ($p < 0.0001$) between children treated daily with a spray containing 3.7% citronella (Sumo repelente®) and those using a placebo[73], but follow up was infrequent. Independent studies (unpublished) have shown that a 3.7% concentration of citronella exhibits toxic effects in lice. Clinical studies of a piperonal based product (Rappell®) also found some effects, but overall the product was only as good as the consistency with which people used it (IF Burgess, CM Brown, unpublished data). Consequently, conscientious users of a repellent may find that it gives a satisfactory protection, but others are disappointed. In the long term it is better to simply check the hair regularly, at least once a week, using a suitable louse detection comb, to identify any new infestation at the earliest stage and eliminate it before it has a chance to become established.

COMBING IN THE SELF CARE OF HEAD LICE

Combing hair with a plastic detection comb (teeth spaced 0.2 -0.3mm) is the most effective way of checking for head lice.
Regular combing to detect early infestation is more practical than long term regular use of 'repellents'.
Trying to remove visible 'nits' (dead egg cases) is unnecessary and there is no evidence that products designed to facilitate nit removal work.
Regular systematic combing to remove all mobile stages of lice at intervals of 3 days can be effective over a period of 2 weeks. Efficacy is comparable with insecticides affected by resistance. However the process requires some skill and much commitment.

What then is the best way to diagnose an infestation? Clearly, knowing what you should be looking for is fundamental to the process. However, at times, professionals who examine for lice regularly during school head checks are no better than relatively inexperienced parents, as evidenced by various samples sent to the Harvard School of Public Health for identification[74]. Correct identification of head louse infestation is important because otherwise children are treated, and in some cases excluded from school, unnecessarily[75]. However the reality of inadequate treatments and diagnoses, has led to campaigns claiming that it is necessary to remove all visible louse eggs and nits (empty egg cases), irrespective of whether they are viable, just in case they could lead to re-infestation. This "no nit" approach has been criticised as ineffective[76] and not addressing the real issues of treatment methodology. Nonetheless the movement has spawned an industry based on developing products to facilitate nit removal. These products have mostly been developed with a poor understanding of the biochemistry involved and there is no evidence that any actually make removing nits easier[77].

It is now widely agreed that diagnostic combing is a superior method to visual inspection in detecting infestation. Combing is generally faster and about four times more accurate than parting the hair and looking for lice[78-80]. It has been claimed that wet combing with conditioner is an even better diagnostic method, but in a comparison with visual inspection it proved only about 1.5 times more effective[81]. Numerous studies confirm that, irrespective of the exact method used, combing using a suitable plastic detection comb, with teeth around

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0.2-0.3 mm apart, is the most appropriate method of initial diagnosis and for checking that a head is louse-free after treatment[37,42-46,54,55,60,61,65-68,75,78-81].

PRACTICAL ASPECTS OF TREATMENT

The usefulness of any treatment, whether a topically applied preparation or an ingested medication, depends largely on pragmatic considerations.

First is availability. If a product is available on prescription only, it is of value only to those who have tried all other options and finally resort to seeking extra help. This option is also only useful if the prescribing practitioner is aware of the relative merits of the options and is prepared to follow through adequately. Rumours that some paediatricians in the US do not admit long term infestations into their offices, but send the nurse to see them in the car park, do not convey confidence in this respect.

Ultimately the best unit for managing head lice is the family unit. Consequently, the majority of infestations are managed using available over the counter medicines and medical devices.

Second is ease of use and clarity of instructions. Many preparations are not as easy to apply as the instructions suggest. Some advertising is also misleading in making treatments appear unrealistically quick and simple, leading people to resort to the instructions only after things have gone wrong. Applying thoroughly (particularly to long or thick hair), or for the full time required, is often not easy or convenient, so misapplication is commonplace.

Third is simple convenience. Most carers prefer shorter application times so they may resort to less effective preparations simply because they are easier to use. The widespread trend for preferring shampoos testifies to this. Consequently, it is incumbent on manufacturers to design their products to work efficiently even if the application time is curtailed by accident or design. Any product that causes severe irritation or stinging, or has an unpleasant odour, is unlikely to attract customers a second time. Alcohol based products fail on several of these counts and so should be avoided if possible.

TREATMENT OPTIONS FOR HEAD LICE 2010

Treatment	Advantages / Disadvantages
Treatment Combing	Moderate efficacy but requires commitment and repeated treatment at 3 day intervals over 2 weeks.
Topical Insecticides	Variable efficacy depending on resistance in the community. Require careful application. Some may cause skin irritation.
Essential and fixed oils, herbal preparations	Doubtful efficacy. Some may cause skin irritation. 'Natural' does not mean 'safe'.
Synthetic oils: siloxanes/silicones	Good efficacy through physical action on lice and resistance will not develop. Require careful application.
Oral ivermectin	High efficacy in topical insecticide 'failures' when dosed by weight. Reliable systemic dosing means resistance less likely to develop. Restricted access – not approved for head lice treatment.

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SUMMARY

Head lice infestation continues to cause irritation and frustration in the modern world as it has throughout history. Self care in the family unit is the best way to manage detection and treatment, and professional advice is often sought only when problems are encountered. An up-to-date knowledge of the options is not always easy to acquire through review of the literature on efficacy since this may rapidly lose relevance over time. Topical insecticide treatments are increasingly failing as head lice develop resistance and this process will continue, reflecting the usage patterns of these active ingredients in local communities. A newly-evaluated oral insecticide (ivermectin) is likely to have a very restricted 'reserve' role. Of more relevance to self-care is the emergence of effective physically-acting products based on mineral oils. Although these topical treatments still require careful application, they will not engender resistance and so are likely to retain their efficacy and therefore offer reliability in use. Treatment combing to remove lice retains an appealing simplicity, but can produce acceptable results only if pursued with diligence. Central to effective self care is the early detection of infestations and this is best achieved by regular use of a comb with suitably spaced teeth.

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