CONTINUING MEDICAL EDUCATION

Head Lice

Epidemiology, Biology, Diagnosis, and Treatment

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SUMMARY

Background: Conflicting information about the proper treatment of head lice has given rise to uncertainty among patients and treating personnel. For example, the reported efficacy of permethrin fell from 97% in the 1990s to 30% in 2010.

Methods: Review of the literature based on a selective search of PubMed.

Results: In Germany, outbreaks of head lice mainly occur among 5- to 13-year-olds returning to school after the summer vacation. Nymphs hatch from eggs after an average of 8 days and become sexually mature lice over the ensuing 9 days. The main route of transmission is direct head-to-head contact; transmission via inanimate objects is of no relevance. Symptoms arise 4–6 weeks after an initial infestation; many affected persons have no symptoms at all. Wet combing is the most sensitive method of establishing the diagnosis and monitoring treatment. Resistance to neurotoxic pediculocidal drugs is increasing around the world. Dimethicones are the treatment of choice, with 97% efficacy. Outbreaks must be managed with the synchronous treatment of all infested persons to break the chain of infestation. If the agent used is not ovicidal, the treatment must be repeated in 8–10 days and sometimes in a further 7 days as well.

Conclusion: Outbreaks of head lice can be successfully terminated by synchronous treatment with ovicidal dimethicones.

▶ Cite this as:
Meister L, Ochsendorf F: Head lice—epidemiology, biology, diagnosis and treatment. Dtsch Arztebl Int 2016; 113: 763–72. DOI: 10.3238/arztebl.2016.0763

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Normally, the prevalence of head lice in the general population of industrialized countries is low. Infestations occur almost exclusively in vulnerable groups: school children, homeless people, refugees, and slum dwellers (prevalence 0.7% to 61% [1, 2]). In the USA it is estimated that 6 to 12 million head lice infestations occur every year (e1). Having head lice is usually associated with negative feelings and can lead to negative consequences such as quarantine, overtreatment, or postponement of surgery (3, 4). Since treatment resistance is on the increase, probably due to the large-scale use of neurotoxic pediculicides (5), this article is intended to provide an account of the present state of knowledge. Further basic information will be found in review articles (6–9, e2).

A selective literature search of PubMed was carried out using the search terms "head lice" OR "pediculosis capitis." As the last review on this topic in *Deutsches Ärzteblatt* was published in 2005 (6), the search was restricted to the time period after this date. The search filter "randomized controlled trial" was employed in compiling the *Table*.

Learning goals

After reading this article, the reader will be competent to treat head lice infestation effectively; he or she will be able to

- explain the life cycle and transmission routes of head lice,
- explain how to diagnose an infestation, and
- give recommendations for treatment.

Epidemiology

The spread of head lice depends on spatial and temporal factors, including the number of susceptible hosts, the duration of the infestation, and the duration and nature of "hair-to-hair" contact. The result is the occurrence of outbreaks of head lice infestation in

Epidemiology

Head lice occur almost exclusively in vulnerable groups: school children, homeless people, refugees, and slum dwellers.

kindergartens and schools (10). There are no population studies on incidence. Prevalence studies from many parts of the world exist, but they are not directly comparable because:

- Diagnostic methods vary in sensitivity. Compared with wet combing, visual inspection of five predilection sites underestimated prevalence by a factor of 3.5 (11).
- In Germany, head lice infestations show a seasonal rhythm, with a peak between the middle of September and the end of October (after the summer holidays) (12).
- Prevalence varies from region to region even within one country (10).

Prevalence studies do not, therefore, reflect the true prevalence of this parasitosis in the population (e3).

Those most frequently affected are children between the ages of 4 and 12. A screening program in Braunschweig (Brunswick) carried out between October 2006 and July 2007, in which 1890 children starting school for the first time (aged 5 to 6 years) had their heads visually inspected for head lice and nits, resulted in an estimated incidence of 598/10 000 (point prevalence 0.7%) (13). In a questionnaire-based study in Norway, a point prevalence of 1.6% was found in a primary school, but in one out of three households surveyed head lice infestation had occurred in the past. It emerged that more densely populated areas showed a higher prevalence of previous head lice infestation than less densely populated areas. Prevalence was also dependent on the number of children in a household (10), or, as was shown in another study, increased when the number of persons in the household went above 6 (14).

In one large study in Belgium, in which 6169 kindergarten and school children (aged 2.5 to 12 years) were examined using the sensitive "wet combing" method, a point prevalence of 8.9% was shown (and 4.6% of children examined had nits, indicating a previous infestation) (14). The school or class visited had a stronger influence on prevalence than individual characteristics of the children. Infestation risk was higher for children with lower socio-economic status, more children in the family, longer hair, and brown hair. Fourteen days after the screening examination, despite appropriate treatment recommendations, head lice were still demonstrated in 41% of children (14). The reason for this was probably lack of treatment, incorrect treatment, or lack of synchronized treatment. Inadequate personal hygiene was not mentioned as a risk factor in any study.

Depending on the endemic region, girls were more often affected by head lice than boys (ratio in Turkey 12:1, in Australia 2:1) (e3, e4). Lice and nits remain undetected for longer in girls' longer hair, and are harder to treat there (8). Having short hair halved the risk (15). The higher prevalence in girls can be explained by this and by gender-typical behaviors (girls group together more closely, boys are only briefly in contact during play); it is not a reflection of any biologically determined increased susceptibility in girls. Only hair length and the hair colors "brown" (14) or "brown and red" (e5) were identified as independent risk factors for head lice infestation. It was assumed that lice can remain undetected for longer in hair of these colors because of their own coloring.

Head lice infestation was associated with densely populated areas, more children or people in one household, longer hair, female sex, and brown hair color.

Biology of the head louse

It is thought that sucking lice of primates co-evolved with their hosts over a period of at least 25 million years. Around 2 million years ago, human lice differentiated into three different groups with different geographic distributions (5).

The development cycle of head lice is shown in *Figure 1*. The time taken by a head louse to develop has implications for treatment.

Eggs are glued to the base of the hairs, immediately adjacent to the scalp. From egg lay to hatching of the first nymphs takes an average of 8 days. A recent report indicated that this interval was up to 13 days in 1.2% of samples examined. Variations are probably due to differences in hair density, temperature, and moisture on different parts of the scalp (17). Egg lay occurs preferentially at the temples, behind the ears, and at the back of the neck (e7). Female lice produce an average of five eggs per day (e8, 18). Head lice live for about 21 days (18). Even first-generation nymphs are mobile, although they move significantly more slowly than full-grown lice (19). The egg cases (nits) found on growing hair >1 cm away from the scalp are empty and are not a sign of active infestation.

In Central Europe, usually fewer than 10 lice per head are found (5). In Australia, the number found in one study was significantly higher [mean n = 30/head (20)].

Prevalence

Prevalence studies are not directly comparable because of differences in the methods used.

Independent risk factors

Only hair length and the hair colors "brown" and "brown and red" have been identified as independent risk factors for head lice infestation.

Most head lice die without ingesting more blood within 30 hours after the last feed (18). In terms of infection epidemiology, however, all that is relevant is how long they remain infectious. It may be assumed that, as a result of dehydration, head lice not in contact with heads are unable to produce saliva, feed on blood, and hence transmit infection (21). Although there are no data about the survival rate of eggs laid off-host, it is unlikely that nymphs can hatch from dehydrated eggs (21). Recommendations for 10-day quarantine of rooms used by people in whom head lice have been found (e9) thus have no rational basis. Thus, the key to infection control is to treat the infested heads, not the environment (21).

The immune system of the head louse has a smaller capacity for phagocytosis than that of the body louse (e10). However, it has been shown that head lice can carry *Rickettsia prowazekii* (the causative agent of classical typhus) and *Bartonella quintana* (which causes trench fever, also known as Wolhynia fever), and probably all infectious pathogens reported for body lice (e11). In rural Ethiopia, *B. quintana* was found in 7% of head lice (e12) and *Borrelia recurrentis* (the causative agent of relapsing fever) in 23% (22). In the context of the large migrations currently occurring, relapsing fever has been diagnosed in African refugees (23). So far, however, it remains unclear what role may actually have been played by head lice in the transmission of these diseases, but they are regarded as unimportant compared to body lice since, because there are fewer of them, less saliva is transferred (5).

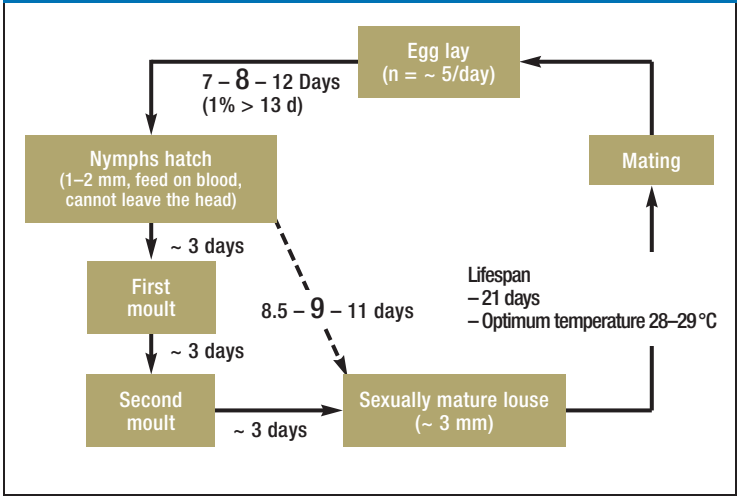
Transmission routes

Pediculosis humanus capitis, the human head louse, is a highly specialized parasite of the human scalp. The main transmission route for head lice is therefore close head-to-head contact. The main place where this occurs is in children during play. Transmission via objects is a rare exception and is epidemiologically irrelevant (e13).

This is however a contentious issue, with proponents on both sides (for: [e9]; against: [21]). Although the "pro" side adduces evidence from *in vitro* studies that do not match conditions in nature, such as transmission through the use of a hair dryer or combing or toweling hair, and egg lay on synthetic textiles among other things (19), the "contra" side has large quantities of data from clinical field studies to draw on. These include, for example, the fact that not a single head louse was found in 1000 head coverings of schoolchildren with head lice (n = 5500 lice found on their heads) (e14). Likewise, no head lice were found on the floors of classrooms in a school with a head lice epidemic (20). Only for a few individuals with high-intensity infestation were a few nymphs found on their pillow the following morning, so that a small, negligible risk of infestation exists, which can be further reduced by washing the pillow case (24). Transmission through the use of a shared hairbrush is also strictly possible, but unlikely (21). *In vitro*, head lice survived for up to 20 minutes in water, irrespective of what kind of water it was (25 °C, deionized water, sea water (100%), salt solutions (30, 60, 120, 240 g/L), and chlorinated water (0.2, 2 und 5 mg/L). During this time they were completely immobilized. During a 30 minute experimental swim in a pool, neither adult lice nor older nymphs were lost from hair. This makes transmission in swimming pools unlikely (25).

The time to infestation varies depending on where the louse is at the time of contact. Probably it is in the order of a few minutes. The human head louse can move along a hair model at a speed ranging from 9.5 ± 1 (19) to up to 23 cm/min (e9). No in vivo data are available on this point. Transmission depends on

FIGURE 1



Life cycle of the head louse (adapted from 16, 17, e6)

Biology of the head louse

Nymphs usually hatch after 8 days, but may take as long as 13 days.

Predilection sites

The temples, behind the ears, and the back of the neck are predilection sites.

BOX

How to perform wet combing (from [39])*

- Wash the hair using an ordinary shampoo
- Apply ample conditioner to aid straightening and detangling
- Straighten and detangle the wet hair using a wide-toothed comb
- Once the comb moves freely through the hair without dragging, switch to a head lice detection comb
- Make sure the teeth of the comb slot into the hair at the roots, with the deeply beveled edge lightly touching the scalp, and draw the comb down to the ends of the hair with every stroke
- Check the comb for lice after each stroke, and remove them by wiping or rinsing the comb
- Work through the hair section by section
- Rinse out the conditioner. Depending on the length of hair, this may have taken 10 minutes (for short hair) to 30 minutes (for longer hair)
- Repeat the combing procedure in the wet hair to check for any lice that might have been missed the first time

* See also (e27)

temporal and spatial factors. For example, lice migrated more easily to a neighboring hair when it was presented slowly, from behind, and parallel to their body axis. At an angle of 90°, no transmission took place (26).

Transmission is dependent on the life cycle of the louse. Synchronized treatment is therefore essential to prevent a series of overlapping infestations within a group.

Clinical aspects

The most tangible symptom of a head lice infestation is itching. This is caused by an allergic reaction to louse saliva and for this reason does not occur immediately with a first-time infestation, but only after 4 to 6 weeks when sensitization has taken place. On reinfestation, itching starts after just 2 days.

At the back of the neck the excoriated "head lice rash" is seen, which can be subject to secondary infection with *Staphylococcus aureus* or streptococci. The hairs become encrusted and stuck together, and the cervical lymph nodes may swell. However, not everybody affected by head lice experiences itching (only 14% to 36%); often it is only the lice themselves, discovered incidentally, that lead to the diagnosis (13, 27, e15). Only when an infestation is really heavy could anemia become a possibility (28, 29).

Diagnosis

Inspection alone does not suffice for diagnosis, even if the entire head is examined (30). In an Israeli study of 7- to 10-year-old schoolchildren, direct inspection found head lice in only 6%, compared to 25% when a nit comb was used (e17). Active infestation is therefore best identified using the "wet combing" technique (*Box*) using a nit detection comb (tooth spacing 0.2 mm) (11). Metal nit combs appear to remove more lice, eggs, and nits from the hair (up to three times more) than do plastic nit combs (31). If one wishes only to determine an infestation that is already over, i.e. to detect only nits and unviable eggs, visual inspection is superior to wet combing (8).

One live louse is enough to make the diagnosis (5). However, misinterpretations are frequent. In the USA, only 59% of all samples sent to an expert center contained typical lice or eggs. In 35% of re-examined samples, dandruff had been incorrectly interpreted as lice, and in 5% other arthropods had been similarly misinterpreted. Only 53% of material that had been interpreted as living actually showed the relevant living parasite stage. Accordingly, 62% of patients had been incorrectly "overtreated" with potentially dangerous substances (32).

Treatment

The *Table* shows the results of randomized controlled trials of topical agents licensed for use in Germany against head lice.

Neurotoxic topical agents

Overuse of neurotoxic pediculicides (organophosphates: malathion, carbamate [carbaryl], pyrethrin [chrysanthemum extract]) or pyrethroids (synthetic derivatives: permethrin, phenothrin, deltamethrin) has resulted in resistant populations of head lice on all continents (e18, 33).

Double and cross-resistances have been shown, underlying which was a point mutation in the region of the alpha subunit of the neuronal sodium channels (*kdr* gene) (34, e19). The efficacy of permethrin fell from 97% in the 1990s to 30% in 2010 (e20).

Infectiousness

Away from the head, head lice die within a maximum of 2 days, but they cease to be infectious after only a few hours.

Pathogens in head lice

In Ethiopia and other places, the same pathogens have been found in head lice as in body lice. How significant they are in the transmission of their associated diseases is at present unclear.

TABLE

Randomized controlled studies on treatment for head lice infestation using substances licensed as topical therapeutic agents in Germany (all evidence level B, publication date 2003 or later)

Author/year/ reference	Study location	Number of probands	Plant-based topical treatments	
Burgess IF et al. 2010 (e28)	United Kingdom	100 children	Substance A	Coconut and anise spray
			Cure rate	83%
			Unwanted drug effects	Itching and burning sensation
			Substance B	Permethrin 0.5%
			Cure rate	44%
			Unwanted drug effects	Itching and burning sensation
Mumcuoglu KY et al. 2004 (e29)	Jerusalem	198 children/adolescents	Substance A	3.7% citronella solution
			Cure rate	88%
			Unwanted drug effects	Itching, unpleasant smell
			Substance B	Placebo
			Cure rate	50%
			Unwanted drug effects	No information
Author/year /reference	**Study location**	**Number of probands**	**Topical treatment with dimethicone**	
Burgess IF et al. 2005 (e30)	United Kingdom	253 children/adults	Substance A	Dimethicone
			Cure rate	70%
			Unwanted drug effects	No information
			Substance B	Phenothrin 0.5%
			Cure rate	75%
			Unwanted drug effects	No information
Heukelbach J et al. 2008 (e21)	Brazil	145 children	Substance A	Two-phase dimethicone
			Cure rate	97%
			Unwanted drug effects	Ocular irritation
			Substance B	Permethrin 1%
			Cure rate	67%
			Unwanted drug effects	None
Kurt O et al. 2009 (e22)	Turkey	72 children/adults	Substance A	Dimethicone
			Cure rate	92%
			Unwanted drug effects	No information apart from "no adverse events"
			Substance B	Dimethicone + nerolidol 2%
			Cure rate	86%
			Unwanted drug effects	No information apart from "no adverse events"
Burgess IF et al. 2013 (e31)	United Kingdom	90 children/adults	Substance A	Dimethicone
			Cure rate	77%
			Unwanted drug effects	Dry skin
			Substance B	Permethrin 1%
			Cure rate	16%
			Unwanted drug effects	Rash

Author/year/ reference	Study location	Number of probands	Topical treatment with permethrin and phenothrin	
Tanyuksel M et al. 2003 (e32)	Turkey	566	Substance A	Permethrin 1%
			Cure rate	94%
			Unwanted drug effects	No information
			Substance B	D-Phenothrin 0.4%
			Cure rate	76%
			Unwanted drug effects	No information
Author/year/ reference	**Study location**	**Number of probands**	**Wet combing**	
Hill N et al. 2005 (e24)	United Kingdom	126 children/adolescents	Material A	Louse detection comb
			Cure rate	57%
			Unwanted drug effects	No information
			Substance A	Malathion 0.5%
			Cure rate	17%
			Unwanted drug effects	No information
			Substance B	Permethrin 1%
			Cure rate	10%
			Unwanted drug effects	No information

Evidence level B: lower-quality randomized clinical studies (e.g., single-blinded, intention-to-treat analysis not used)

As a rule, neurotoxic substances are well tolerated. However, they have been criticized because of the possibility of resorption, hypersensitivity, and neurological complications after accidental swallowing, and a potentially increased risk of leukemia (5).

Topical treatment with dimethicones

In direct comparisons, dimethicones were more effective than permethrin (e21). Dimethicones are synthetic silicone oils. They spread very well on surfaces and work in a purely mechanical way by sealing the spiracles (breathing pores) of the head lice. There is therefore no reason to anticipate the development of resistance. They are not toxic (35).

With 4% dimethicone and 96% cyclomethicone, 70% to 92% efficacy was achieved, depending on the number of head lice (e22). A mixture of two dimethicones showed an efficacy of 97% irrespective of the severity of the infestation (e21).

In vitro, this mixture even killed off young and mature eggs (95% and 100% respectively), whereas the monopreparation and neurotoxic drugs were ineffective (36). When ovicidal substances were also used, a single treatment appears to be normally sufficient.

Dimethicones, especially cyclomethicone, are flammable. For this reason, contact with potential sources of fire, such as cigarettes or hair dryers, should be avoided during treatment.

Systemic treatment

The efficacy of ivermectin has been well documented in several clinical studies. The dosage is 200 µg per kilogram body weight (2 × in a 7-day period). The cure rate is up to about 97% (37, 38, e23). Ivermectin is not

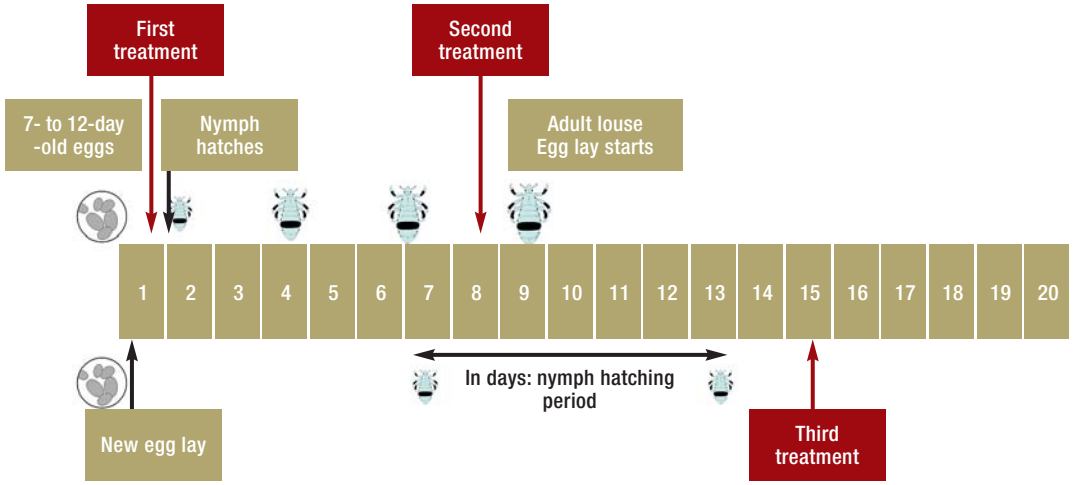
Transmission route

The main transmission route for head lice is direct head-to-head contact. Field studies suggest that transmission via inanimate objects is not relevant.

Symptoms

The main symptom is itching, caused by sensitization to louse saliva, which starts at about 4 to 6 weeks after the first infestation.

FIGURE 2



Treatment for head lice
Course over time of therapeutic interventions in the life cycle of the head louse

licensed for the treatment of head lice in Germany, but may be considered for use on an individual basis, e.g. in a patient with concurrent scabies. It is contraindicated in persons with a body weight of less than 15 kg, and in pregnant or breastfeeding women.

Alternative treatment options

Repeated wet combing (*Box*) is also effective. According to one study in the UK, mechanical removal with a detection comb (no information was given about how often it was used) was even more effective than a single application of a pediculicide (e24). The optimum procedure is to comb every 3 days until after four successive combings no more head lice are found.

This approach is recommended particularly for pregnant and nursing mothers, babies, patients with open wounds on the scalp, patients with asthma, and any who have reservations about using chemical substances (39).

Cleansing the environment after a head lice infestation

If parents wish, they can thoroughly cleanse combs and hair brushes in hot soap solution, even though the risk of transmission is negligible. Head lice in pillows are killed by washing at >60 °C or drying for 15 minutes in a dryer at 60 °C. Cold washing and hanging up to dry were ineffective (24). Treatment of furniture upholstery and carpets is not necessary since the lice, as already described, only survive for a short time away from their host, so that transmission via textiles is irrelevant in terms of infection epidemiology (21). In addition, no studies exist about whether the washing of clothing prevents reinfestation or small-scale outbreaks.

Studies have shown that lice can only be removed with normal commercially available vacuum cleaners for floors; so-called table or handheld vacuum cleaners are inadequate for louse removal (19). In the lay media, the recommendation is repeatedly seen to keep all non-washable textiles, underwear, bed linen, and soft toys in closed plastic bags for 3 days. This recommendation has no basis in science.

Treatment failure

The efficacy of treatments as shown in *in vitro* or controlled studies is not usually achieved in practice. This may be due to incorrect application: the exposure time

Alternative treatment options

The presence of lice and eggs is best demonstrated by "wet combing" using a metal detection comb ("nit comb"). Conditioner allows the hair to be combed through. This technique can also be used as treatment.

Treatment of exceptional cases

Local treatment suffices for all but exceptional cases of head lice infestation. Many head lice are resistant to pyrethroids. Good results without the development of resistance are achieved with dimethicones.

is too short, too little of the substance is applied, it is unevenly applied, or the solution is too weak once it is applied to hair that is dripping wet.

Another mode of failure is when repeat treatment fails. Unless an ovicide is used, the treatment must be repeated on day 8 (day 1 = first day of treatment) so as to eliminate the nymphs that were protected inside eggs at the time of the first treatment before they are sexually mature and can lay new eggs (*Figure 2*). Studies have shown that after egg lay some nymphs may hatch later, after 13 days (17). In the worst case, therefore, nymphs that survived the first repeat treatment undamaged inside the egg may not hatch until the 13th day. The only way to eliminate these would be a third treatment on day 15 (*Figure 2*). Ovicides, on the other hand, only need to be applied once.

Moreover, asymptomatic individuals, especially children, can be undetected carriers. This explains recurrent minor outbreaks (e25), and is the reason why potentially infested contact persons, such as family and play group, must all be treated at the same time ("synchronized treatment"). Mathematical modeling has shown this to be effectual (40). When safe pediculicides such as dimethicone are used, this can also be given as a "blind" recommendation, when it is not possible to perform diagnostic wet combing.

Legal requirements

In Germany, the presence of head lice is not a notifiable disease- or pathogen-specific condition under the Infection Protection Act (IfSG, *Infektionsschutzgesetz*). However, according to paragraph 34, section 6, of the IfSG, senior managers of community facilities must notify the relevant health authority immediately if an outbreak of head lice occurs in either members of the public or personnel (e26). The notification must name the persons affected. Consequently, the parents of children affected by head lice are under an obligation to inform the management of the community facility (school) so that the management can inform the health authority. In the case of an outbreak of head lice, it may be assumed that after competent treatment using appropriate means, further spread of the outbreak is very unlikely. Consequently, any person who has been treated may return to the building (e.g., school) on the day after treatment. The Infection Protection Act does not require that a doctor's certificate be obtained.

Conflict of interest statement
The authors declare that no conflict of interest exists.

Manuscript received on 18 February 2016, revised version accepted on 16 August 2016.

Translated from the original German by Kersti Wagstaff, M.A.

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Management of outbreaks

Children are often undetected carriers. For this reason, potentially infested people who have contact with the child, such as family and play groups, should be treated synchronously.

Legal requirements

A person who has suffered head lice infestation may re-enter community facilities after appropriate treatment.

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Supplementary material
For eReferences please refer to:
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Question 1
Which age group has the highest incidence of head lice?
a) 1–4 years
b) 5–13 years
c) 14–21 years
d) 22–40 years
e) > 40 years

Question 2
Which of the following has been identified as an independent risk factor for head lice infestation?
a) Brown hair
b) Rural environment
c) Infrequent hair washing
d) Short hair
e) Male gender

Question 3
What is the average time from egg lay to the development of adult head lice that can lay their own eggs?
a) 8 days
b) 9 days
c) 12 days
d) 15 days
e) 17 days

Question 4
A father comes into the doctor's office with his child, who together with the rest of his class has received preventative treatment for head lice. The father wants to know whether his child has actually had any head lice. He has read that in this situation one can look for nits. Which area of the head is the best place to start looking?
a) Eyebrows
b) Entire scalp
c) Back of the neck
d) Vertex region
e) Above the ears

Question 5
What is the main route of transmission for head lice?
a) Bed linen
b) Head contact
c) Soft toys
d) Hats and caps
e) The wind

Question 6
What causes the itching in head lice infestation?
a) Allergic reaction to saliva
b) Crawling head lice
c) Bites from head lice
d) Superinfection with Gram-positive cocci
e) Transmitted infectious disease

Question 7
A mother attends the doctor's office, very upset. It has been said at kindergarten that a child in the same group as her child has got nits (head lice). She is worried that her child will get them too. What is the surest way to determine whether the child has head lice?
a) Ask whether there are any symptoms
b) Inspect the predilection sites
c) Inspect the entire scalp
d) Dry combing
e) Wet combing

Question 8
Live head lice have been found on the head of one of the children in the Red Group at kindergarten. In addition to informing parents, what is the best way to proceed?
a) Treat all children in the Red Group consecutively
b) Treat all children in the kindergarten consecutively and include the kindergarten teachers and assistants and family members
c) Treat all the children at the kindergarten synchronously
d) Treat all the red-haired children in the Red Group synchronously
e) Treat all persons synchronously who have contact with the affected child

Question 9
A child has been treated with topical 4% dimethicone. How should the treatment be continued?
a) Weekly inspection of the scalp with no further treatments
b) Further treatments with dimethicone if live lice are found again
c) One more treatment is recommended, after 7 days
d) Two more treatments are recommended, after 7 and 14 days
e) Three more treatments are recommended, after 7, 14, and 21 days

Question 10
A child is treated with an ovicidal dimethicone-based product. When may that child return to kindergarten?
a) The day after treatment
b) Seven days after treatment
c) Fourteen days after treatment
d) When no more nits are found
e) When no more live lice are found

Supplementary material to:

Head Lice

Epidemiology, Biology, Diagnosis, and Treatment

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Dtsch Arztebl Int 2016; 113: 763–72. DOI: 10.3238/arztebl.2016.0763

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