THE CURRENT STATUS OF LOUSE INFESTATIONS THROUGHOUT THE WORLD

Norman G. Gratz 1

Introduction

International health agencies are paying increasing attention to the global surveillance of communicable diseases and to continuing assessment of the risks of epidemic outbreaks of such diseases. In the case of vector-borne diseases, it is essential, if surveillance is to be effective, to have accurate information on the vectors' distribution and population density as well as on seasonal changes or trends in population density; such information, along with that on the incidence of infections in human or animal reservoirs, must be available to enable public health authorities to determine the extent to which their countries are at risk from outbreaks of these diseases.

This paper will review the information available on body louse vectors of disease to determine if it is adequate for the above purposes, and also review our information on the distribution and density of head and pubic lice, even though they are not vectors of disease.

Body lice infestations

There appears to be almost no part of the world where infestations by body lice have not been found and are not still found to one extent or another. An understanding of the factors that influence the distribution and density of infestations in human populations is important for predicting the possibility of population increases occurring or for enabling measures to be taken to ensure that such increases do not occur. Often, body louse infestations are more likely to be affected by the hygienic habits of human population groups or of individuals within those groups than by external climatic factors. Increases in body louse infestations may be expected in human populations under such stress situations as war, sociopolitical upheaval, or famine, or in more discrete populations under stresses such as those in jails, refugee camps, or deprived neighborhoods. Infestations can rapidly increase when large numbers of people are thrown together without adequate hygienic supervision, as in certain military situations, asylums, hostels, or even schools. The potential for increase is very great, and Buxton (4) published life-tables giving the potential for growth under conditions favorable and unfavorable to body louse populations, demonstrating that even under the latter circumstances louse populations can increase rapidly. Knowing this, one must conclude that the constant surveillance of human populations for body louse infestations and typhus is as important as the need to suppress and hold body louse infestations down to the lowest possible level.

Before the advent of the synthetic organic insecticides, body louse infestations could, and did, rise and remain at very high levels in both developed and developing

1 Vector Biology and Control, World Health Organization, Geneva, Switzerland.
countries. The infestations that occurred in Europe during and immediately after the two World Wars and the concomitant epidemics of typhus (and, to a lesser extent, relapsing fever) are well known. Far more has been reported about the distribution of the disease than of the vector, however. Biraud (2) gave a detailed report on the extent of typhus during World War II, but this report contains very little information on the prevalence of lousiness at the time. Since the war and the signal success of DDT in controlling the epidemic typhus in Naples in early 1944, it appears that even less attention has been paid to the frequency of body louse infestations than in the past, apparently in the tacit belief that such infestations could be rapidly controlled should outbreaks of louse-borne disease occur.

But since the appearance of body louse resistance to DDT (14) and the later geographic extension of this resistance and that to BHC as well (31), a choice of insecticides for louse control has no longer been so readily available; the recent appearance of resistance to malathion (21) has further increased the difficulties of supplying effective insecticides. The problem of quick access to effective insecticides, added to the logistic difficulties in carrying out effective dusting campaigns under the difficult conditions such as exist in the typhus foci of Burundi, Ethiopia, and Lesotho, make it imperative that the incidence and distribution of body louse infestations be assessed to allow for control planning before outbreaks of louse-borne disease occur.

Recent surveys of body louse infestations

Comparatively accurate information is available about the geographic distribution of the foci and outbreaks of louse-borne typhus and epidemic relapsing fever. While body lice are obviously known to be present in those areas from which cases of louse-borne disease have been reported, little if any information is available about the extent of the infestations either within the foci of disease or elsewhere. What current information is available will be reviewed below.

Africa south of the Sahara

In this region, louse-borne typhus is an extremely serious public health problem in Burundi, Ethiopia, and Rwanda; cases have also occurred in lesser numbers in Lesotho, Nigeria, South Africa, Sudan, and Zaire. Louse-borne relapsing fever occurs mainly in Ethiopia, with a few cases reported from Sudan and Zaire. Despite the large number of cases of typhus reported from Burundi (16,059 in 1970 and 6,000 in 1971), virtually no surveys of infestation have been carried out, perhaps for the simple reason that lousiness is so widespread. Wisseman visited Burundi as a WHO consultant in 1967 and observed in his report to the Organization that in the areas of the country between 1,600 and 2,000 m high, heavy garments are worn because of the cold and, owing to the general impoverishment, washing facilities are seldom available, so that the garments are rarely laundered. He concluded that almost all the population living in the high altitudes could be considered infested with body lice. A. Danilov, a WHO entomologist, visited Burundi in 1968 to carry out insecticide susceptibility tests on the louse populations and reported that most people he examined in the rural areas were infested, but he gave no data.

M. L. Tarizzo and G. Morcos of WHO visited Lesotho in March 1972 following an outbreak of typhus in that country in 1971. In their report to WHO, they mentioned that the relatively cold climate and limited socioeconomic development and poor sanitary conditions favored the presence of body lice in the local population, but it was not feasible to carry out an infestation survey.

The author visited Ethiopia in 1969 and at that time attempted to obtain information
on body louse infestations. The authorities were aware that such infestations were widespread in the mountainous areas of the country and especially serious in some of the jails, but no data were available and no surveys appear to have been made.

Insecticide susceptibility tests on body lice have been reported from Madagascar, Mozambique, Nigeria, Sierra Leone, Tanzania, and Uganda (31), but no information is available or has been found on the extent of infestations in these countries.

*Mediterranean area*

Although louse-borne typhus is no longer a major problem in this geographic area, 40 cases of the disease were nevertheless reported from seven mountainous departments of Algeria in 1971. Le Corroller and coworkers (15) reported in 1970 on the history of epidemic typhus in the center and south of Algeria into the Sahara, but made no mention of the extent of body louse infestations in other areas of the country.

In 1969, the author visited Tunis in connection with a flood emergency which had occurred in that country. He was informed that everyone who had fled from the flooded areas had been dusted with 10 per cent DDT because body louse infestations were widespread, but he could find no data on the actual incidence of infestation, although the outpatient departments he visited reported that infestations were quite common among patients. Dancesco and Romain (6) support these impressions of body louse infestations in Tunisia. While obtaining lice for susceptibility tests, they collected lice from a group of 208 children in the medina of Tunis during a water shortage when underclothes had not been laundered for five weeks; infestations were high and more than 200 lice were frequently collected from one child.

No current reports seem to be available from Morocco, though body louse infestations there are probably comparable with those in Algeria and Tunisia. Shalaby (25) described susceptibility tests on body and head lice from many areas of Libya, and body lice are presumably widespread in that country.

Infestations are common in the rural areas of Egypt. Shawarby (26) carried out a trial of DDT and BHC dusts against body lice in a village in one of the southern provinces of the Nile Delta in 1950; in the three pretreatment louse counts, 4,384 persons were examined and 722 or 16.5 per cent were positive for body lice, with an average of 1.2 lice per person. Later Shawarby (28) evaluated a rapid method for surveying body louse infestations based on examination of collars or neck bands only. He examined the clothes of 8,323 persons in villages in several parts of Egypt and found 2,549 positives or 30.6 per cent. Infestation rates varied from 13 to 40 per cent in the six villages examined. The examination of collars alone gave only 28.9 per cent positives, a difference of 1.7 per cent, and it was concluded that examinations of collars or neck bands only was a practical method for evaluating antilouse programs. Later, in carrying out field trials of the efficacy of malathion in Egypt, Shawarby and coworkers (27) found the following percentage of positives for lousiness before treatment: 24 per cent in a village of the Giza Governorate, 30.5 to 84.9 per cent in villages in El Faiyum Governorate, and 36.2 to 72.5 per cent in Beheira Governorate.

Body louse infestations are apparently quite rare in Israel and are not considered to represent an important problem in vector control. No cases of louse-borne disease have been reported in that country for more than 25 years and those infestations that are found are mainly among nomads and occasionally on vagrants seen in jails.

Surveys carried out in temporary refugee camps in Jordan in 1969 and reported to WHO showed that the average index of infestation in the camps based on weekly survey
was 1.7 per cent. Mass insecticide dusting campaigns are periodically carried out to ensure that the rates remain low.

**Europe**

Cases of louse-borne typhus, both epidemic and recrudescent, have appeared in Yugoslavia every year until recently. Gaon and Murray, who have described them (12), mention finding lice in “only 16 of the 24 families” searched in a Bosnian village where recrudescent typhus had appeared and in 3 to 8 per cent of the family members. They emphasized the importance of effective louse control in the foci of recrudescent typhus.

Makara has observed (personal communication) that it is very difficult to characterize the status of body louse infestations in Hungary since they vary greatly from one region to another, although he considers gypsies the principal reservoirs of typhus and carriers of lice. About 4 million people in the country’s population are screened yearly, mostly school children and other suspect groups. Louse infestations appear to have leveled off, though there seemed to have been an increase in 1969 and 1970; the division between head and body louse infestations is not clear from the reports.

Duport and coworkers (8) observed that the antilouse campaign in Romania has made it more difficult to find body louse populations for insecticide susceptibility tests. They collected lice from children in six localities and from gypsies on the outskirts of the same six localities. No overall figures or rates of infestation are otherwise presented.

Body louse infestations occur in various regions of the U.S.S.R., but no information could be found on the distribution or intensity.

Nicoli and Sautet (22) investigated the susceptibility of body lice to insecticides in southeastern France and their frequency in different groups. Their studies included the lower Rhone valley, the neighboring mountainous areas, the Riviera, and Corsica.

Though large groups were studied, few statistics are given other than for vagabonds, among whom body louse infestations ranged from 5 per cent in the five- to 20-year-old age group to 15 per cent in the 51- to 60-year-old group. Numerous infestations were found among workmen of North African origin in some cities. Body louse infestations were rare among army recruits or soldiers in transit, or in schools and prisons except among imprisoned vagabonds. The authors stated that they were unable to make valid comparisons of infestation rates between the different regions studied.

No information was found for other European countries or the United Kingdom except for an occasional mention of body louse infestations among poor itinerants and tramps.

**Asia**

Inquiries were made of several countries in Asia, including India, Indonesia, and Nepal. Body lice are known to be present in each and thought to be especially common in the mountainous areas where more clothes are worn, and changed or laundered infrequently. No data were reported on infestation rates or exact geographic distribution.

In an unpublished report to WHO in 1963, X. H. Gilbert found body louse infestations in Afghanistan to be high. Seventy-five per cent of the men in institutions of unspecified nature in Kabul had lice, and in five villages of the Sowati area more than 80 per cent of the 10- to 14-year-old boys examined had a few body lice, though more had head lice.

A special effort was made to obtain information on body louse infestations in Korea and elsewhere in the Western Pacific. It was found that almost no current published or unpublished data exist. A WHO team in Korea wrote in 1972: “It is impossible to get any information on the rates of infestation by body lice of the human population in Korea. It seems rather uncommon in rural areas and is practically unknown in the
This is certainly supported by the decline in epidemic typhus cases from a peak of 32,211 in 1951 to none in the last few years. Epidemic relapsing fever has also not been reported since 1962.

**Western Hemisphere**

Body louse infestations are certainly very common in those highland areas of the countries from which louse-borne typhus has been reported in the last 10 years—Bolivia, Chile, Colombia, Ecuador, Guatemala, Mexico, and Peru. Unfortunately, very little quantitative information is available from those countries or elsewhere in the Western Hemisphere. The few surveys that have been made have been associated with investigations of focal typhus outbreaks or insecticide field trials, and have not covered large portions of the population. An example is a survey by Olivera Toro (23) in 1964 in a village in Michoacán State, Mexico, as part of an insecticide trial in which 282 of the 293 inhabitants were examined and all were found infested with body lice. Another is a report on an investigation of an outbreak of 42 cases of louse-borne typhus in mountainous northwestern Guatemala between November 1971 and January 1972 (30); because of the altitude of 3,100 m, the yearly median temperature of 14°C, and the religious and social customs related to clothing, virtually the entire population is infested with body lice. This outbreak and that in a neighboring village in 1970 have helped increase the number of cases since 1968; no louse-borne typhus had been reported in Guatemala between 1959 and 1968, and the increase is thought to be related to louse resistance to DDT.

There has been speculation that the incidence of louse infestations is increasing in the United States. As will be seen below, if such increases do exist they are probably in head lice. A personal communication to WHO from a pest control firm reported increasingly frequent requests being received, mostly from a local hospital, for the disinfection of lousy clothing. When contacted, the hospital authorities reported that they do see many cases of body lice infestation among their indigent patients, almost all of whom are single, homeless men over age 50; while they keep no records on body lice, they had the impression that infestations had been decreasing rather than increasing in the last three or four years. The hospital further stated that there was a short-lived “minor surge” of body lice in the young hippie population, and concluded that homeless hippies have problems, but not that of lice. Head louse infestations are apparently common in some areas of the United States, but few or no published data are available.

Our overall impression is that body louse infestations remain widespread and common in many parts of the world, though almost no statistical information is available from most areas. As has been said above, the absence of such information makes it extremely difficult to judge the risk of outbreaks of louse-borne disease, nor can any valid conclusion be reached as to whether body louse infestations are becoming more widespread or not.

Recognizing that global surveillance of louse-borne typhus and its vectors would be most difficult in the absence of such information, WHO has published a “Technical Guide for a System of Louse-Borne Typhus Surveillance” in the WHO Weekly Epidemiological Record (29). Under Section 2 (“The louse vector”), the following is stated:

2.1 Presence of body lice and index of infestation

Data on the presence of body lice are an essential part of the surveillance system. Some idea of the prevalence of body lice in an area may be obtained at the outpatients’ clinics in the area. The index of infestation is taken as the number of lice found per person. Surveys may be made in special groups of the population to ascertain their index of infestation (such as prisoners); they may also be made by examining the occupants of houses, including their bedding and clothing, to obtain the average index per household.
2.2 Louse susceptibility to insecticides

Resistance of lice to commonly used insecticides of the DDT, HCH-dieldrin (lindane) and organophosphorus (malathion) group has been demonstrated. Samples of lice should therefore be collected for testing whenever vector control measures may be considered. Tests for susceptibility levels should be carried out by the WHO standard method. Test kits with relative instructions are available from WHO.

The results of such insecticide susceptibility tests should be sent to WHO in Geneva for computer storage as part of the Organization's program of global surveillance of the level of insecticide susceptibility among vectors of disease.

Knowledge of the incidence and density of body louse infestation in foci of louse-borne typhus, when considered in association with a knowledge of the insecticide susceptibility status of the lice in the same geographic area, will serve as a basis for effective vector surveillance and will facilitate rapid control measures, should they be necessary.

Head lice

Though the head louse, Pediculus humanus capitis, is not a vector of disease in nature, serious infestations may cause severe irritation, and the consequent scratching frequently leads to secondary infection, often associated with impetigo. Body louse infestations are usually associated with poor personal hygiene and poverty, and in advanced countries these infestations are usually found among the aged homeless, but head louse infestations are found primarily among the young and may be widespread among youths who are otherwise clean.

Head louse infestations were readily controlled following the advent of the chlorinated hydrocarbon insecticides, and the incidence of infestation in most developed countries dropped with the widespread use of these compounds. From many reports it appears that this trend has been reversed and that in the last few years there has been a serious recrudescence of these infestations.

This was highlighted in the 1970 annual report of the Department of Education and Science of the United Kingdom, which stated that 223,422 children in state schools in England and Wales were found infested with head lice in that year. Busvine has estimated (personal communication) that at least as many children in nonstate schools, children older than school age, and adults are infested and that the actual figure for the United Kingdom as a whole may be as many as 1 million infestations. Donaldson (7) found that 15.8 per cent of 3,576 pupils in infant and junior schools and 26.5 per cent of 600 pupils in two secondary schools were infested with head lice. Maunder (19) demonstrated that head louse resistance had developed to DDT and HCH-dieldrin in an area of East London where infestations had risen to 25 per cent of the children in two primary schools. These infestations were successfully controlled by 0.5 per cent malathion lotion (5, 17, 18). Although these rates of infestation are certainly high, they are lower than those found by Mellanby (20) in 1941 when he reported that, among 52,445 individuals surveyed in 10 industrial cities, head louse infestation rates were as high as 42 per cent among one- to four-year-old boys and 47 per cent among girls of the same age. Among five- to eight-year-old girls, the percentage rose to 49, though it dropped to 33 among boys. Busvine (3) showed that head louse infestations were dropping steadily in British school children between 1940 and 1963, and so it seems clear that there has been a significant recrudescence of head lice in the United Kingdom since the latter year. While this has been ascribed to changes in hair length and bathing habits, in view of the high rates of infestation that existed in the 1940's, it would appear that the gradual development of insecticide resistance may be a more important, though not the only, factor.

Similar increases are occurring elsewhere in the world. For instance, a report (13)-
from British Columbia, Canada, described an outbreak of head louse infestation in schools in an area in which lice had not been noted for 20 years. The outbreak, which the author ascribes "to some natural condition favouring recrudescence of the lice," was controlled with some difficulty by using several insecticides, including lindane, DDT, Bornex, and Cuprex.

It is also interesting to note a paragraph from the yearly report of the Danish Pest Infestation Laboratory for 1971 that states, "There were 88 inquiries about lice, a great increase in proportion to previous years, which no doubt reflects the fact that lice are more common today than just three years ago."

Lidror and Lifshitz (16) inspected several thousand children in schools in several villages in Israel and calculated an infestation rate of 39.5 per cent in settlements of new immigrants from eastern and North African countries. Infestation rates in schools in districts where the children were either of old settlers or immigrants from western countries were only 3.3 per cent.

Head louse infestations are certainly far more widespread than those of body lice, but even less information is available on the actual geographic distribution of these infestations or the incidence in infested areas. The appearance of insecticide resistance to the chlorinated hydrocarbons in *P. h. capitis* populations in the United Kingdom indicates that control of head lice in a population will probably be even more difficult in the future than it has been in the past. It would be desirable to encourage surveys in a number of countries similar to those carried out by school authorities in the United Kingdom to determine just what the magnitude of the problem is and prepare a basis for future lice control operations.

**Crab lice**

The crab louse *Pthirus pubis* has usually been thought to be associated mainly with certain socioeconomic classes, but the spread of this species to other groups has been very well described in a paper by Ackerman (1) in connection with *P. pubis* infestations in the United States: "Today, crabs are harbored not only by streetfighter and streetwalker, but by executive and debutante. A unique contemporary source for dissemination of crabs is the 'hippie love-in' where more than flowers is exchanged. It is not surprising that the incidence of *P. pubis*, like that of other venereal diseases, has risen significantly, as the boundaries of sexual freedom have blurred." Though Ackerman presents no information to substantiate the reported increase in incidence of *P. pubis* infestations, Fisher and Morton (10) present data showing that in the United Kingdom such increases are not only relative, but absolute. They found that, between 1954 and 1968, there had been a real increase of infestations among the 10,243 patients examined in clinics in Sheffield. The percentage of infestation rose from 0.8 in 1954 to 3.2 in 1966. The incidence was higher in girls aged 15 to 19 and in men of 20 and above. Among the 225 infested patients, 105 cases of other sexually transmissible conditions were found. This high degree of association suggests that more knowledge of the extent of *P. pubis* infestations would be useful.

Two rather curious reports of pthiriasis have been noted. Frye and Furman (11), following up the finding of a *P. pubis* infestation of a shepherd dog, discovered that the animal shared a bed with its master and both were infested with crab lice. Edler (9) reported finding crab lice in the eyelashes of a 19-year-old girl from Ystad in southern Sweden. The infestation was limited to this site, no lice being found in her genital or anal region. He mentioned that this species had been rare in Sweden in the previous 20 years, and considered that the case resulted from a new ferry service between Ystad and Poland.
Scabies

It is noteworthy that the apparent increase or recrudescence of lice infestations has been paralleled by an increase in the incidence of scabies (Sarcoptes scabiei). In the United Kingdom, the rate per 100,000 pupils rose from 68.1 in 1965 to 223.8 in 1970, according to the 1971 annual report of the Department of Education and Science. Palicka and Merka (24) summarized the current status of scabies in Europe and stated that in the 1960's an increase in the incidence of the condition was reported in practically every country in Europe. As is the case with crab lice, increasing sexual promiscuity may be one of the causes, since the greatest increase in incidence of scabies was found in persons between the ages of 16 and 19 years.

Conclusions

It seems that body louse infestations persist in most parts of the world, and infestation rates remain very high in some areas of low socioeconomic development and poor sanitary facilities. Several of these areas are foci of louse-borne typhus and louse-borne relapsing fever. A review of the current literature and reports to WHO gives no indication that the body louse problem has grown more severe in the last few years. Almost no surveys have been carried out in recent years on cross-sections of infested populations other than spot surveys associated with insecticide susceptibility tests or as follow-ups to insecticide operations after outbreaks of louse-borne disease. The increasing spread of insecticide resistance in body lice has made it even more important that periodic information be obtained on the geographic distribution and intensity of body louse infestations so as to indicate to public health authorities those areas most at risk of louse-borne disease and thus where insecticide control must be readied.

Following the introduction of the chlorinated hydrocarbons, there was a general decline in the intensity of head louse infestations in the developed countries. In recent years, however, there appears to have been a serious recrudescence of head louse infestations in several European countries and possibly in the Western Hemisphere as well. The reasons for this increase are not clear, but one possible explanation is the recently detected development of head louse resistance to the chlorinated hydrocarbon insecticides.

There has also been a considerable increase in the frequency and distribution of Pthirus pubis, or crab lice, infestations, and it would appear that this is associated with a general increase in sexual promiscuity.

Reports from Europe show that the increase in crab lice and head lice have been accompanied by increases of reported infestations of scabies, and such increases appear to be greatest in the 16- to 19-year-old age group.

REFERENCES


I. A. LOUSINESS AND LICE CONTROL

DISCUSSION

Jakob A. Gaon. Louse eradication programs in Yugoslavia. Field studies carried out in a number of countries have shown the efficacy of insecticides against lice and typhus, but little has been said about the implementation of other control methods in this field (5, 6, 8, 9, 10, 15, 18, 22, 23, 24, 26). In this paper, then, we will draw on our long experience in the control of lice and typhus in Bosnia-Herzegovina as well as in various other parts of Yugoslavia to review Yugoslav approaches to the control of lice and louse-borne diseases. We are aware today that, unless we undertake broad action to put an end to lousiness or to achieve a very low louse infestation rate, it is impossible to attain complete eradication of louse-borne typhus, louse-borne relapsing fever, and trench fever.

Classical typhus creates the carrier state that may turn into recrudescent typhus. In a lousy environment, recrudescent typhus cases may infect lice and cause spread of the disease to an individual or a number of typhus patients. Trench fever also produces late recrudescent cases, making it possible for body lice to become infected (16, 17). While louse-borne relapsing fever has been present in some African countries in times of both peace and war, in the Eastern European countries such as the Soviet Union, Romania, Hungary, and Yugoslavia it has occurred during wartime and has usually accompanied outbreaks of typhus. The latter occurs after wars as primary cases of classical typhus and as Brill-Zinsser disease cases. Louse-borne relapsing fever usually disappears suddenly and completely only several years afterwards (27).

Between 1946 and 1949 louse-borne relapsing fever in epidemic form predominated in some rural parts of Yugoslavia, along with outbreaks of classical typhus. There had been a steady incidence of Brill-Zinsser cases, together with sporadic cases and small epidemics of primary louse-borne typhus, up to 1966. Some of those cases were clearly related to a previous Brill-Zinsser case.

It is not known where the foci of louse-borne relapsing fever are located in the inter-epidemic period. This is the reason why we cannot expect to eradicate this disease without eradicating lousiness (13).

Our long efforts to control typhus in Bosnia-Herzegovina indicate that it is easy to control outbreaks of typhus and extirpate lice in infested areas with the help of insecticides and by applying other antiepidemic measures. Such is not the case with the eradication of typhus, however. To achieve that, it is necessary to decrease to a low rate or eradicate the lousiness in a larger area inhabited by people who have been affected by typhus and who are therefore candidates for Brill-Zinsser disease.

Lousiness is a sociobiologic phenomenon that decreases with improved economic and social conditions and ultimately disappears.