

MOSQUITO CONTROL IN ROME

by

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1 - INTRODUCTION

The mosquito control in Rome reached the peak of efficiency in the first thirty years of this century, with the purpose of checking malaria, then very rife in the "Agro Romano".

After 1950, however, when malaria had been stamped out by means of DDT, the whole of the anti-malaria Service was progressively demobilized, whilst the nuisance caused by the biting of non-malarial *Culicidae* has progressively increased. Serious mosquito infestation has been observed during the spring, summer and autumn months of the last ten years, especially in some newly-built suburbs and districts on the outskirts, where sleep often becomes impossible at night, with serious effects on the physical and psychical health of the inhabitants.

The present problems of mosquito control in Rome are both complex and varied. The Municipality covers an area of 200.000 hectares, with a population of about 3.000.000; it comprises a large city, some 30 miles of Tyrrhenian coastline from Palidoro to Ostia Lido with numerous seaside resorts, the Castel Porziano game reserve and the Castel Fusano Pine Grove.

What is more, there is no longer a sharp dividing line between urban and rural populations. The gradual expansion of the built-up area of Rome and the growth of residential estates in areas that are prevalently rural have given rise to hygienic situations that are often difficult to control. It must also be remembered that urban development has spread in every direction without following any plan whatever, even the most elementary of local hygienic problems being left unsolved. Hundreds of small *Culex pipiens* breeding places have been created by the irrational treatment of sewage waters with local plant. In 1961, Rome Health Department launched a study and research scheme in both the entomological and practical fields, with the aim of carrying on a more rational anti-mosquito campaign, and it is deemed opportune to bring the results to the notice of everybody concerned with this problem.

2 - ENTOMOLOGICAL AND ECOLOGICAL PREMISES

The research work started in Rome in 1961, with the collaboration of the Experimental Station for Medical and Veterinary Entomology at Monticelli (COLUZZI and VALENTI, 1962), in the scope of determining the species most frequently encountered, and locating larval breeding

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places in the built-up areas, the suburbs and the "Agro Romano" 22 species of Culicidae were thus reported, numerous examples in both the larva-chrysalis and adult stage being caught (the names and relative percentages of these species are shown in Table 1). From the hygienic and health point of view, the harmful or troublesome species for which the control is necessary are the following :

- a) Anophelines, still present ten years after the disappearance of malaria from the area,
- b) Tree and wood *Aedes*,
- c) *Culex pipiens autogenicus*.

TABLE 1

SPECIES OF CULICIDAE OBSERVED IN ROME MUNICIPAL AREA IN 1961-62. SUMMARY OF EXAMPLES FOUND.

SPECIES	NUMBER OF EXAMPLES FOUND	PERCENTAGE
ANOPHELES		
<i>A. maculipennis</i>	6	1.08
<i>A. melanoon</i>	17	3.07
<i>A. clav. missirolii</i>	13	2.34
<i>A. clav. petragnagni</i>	5	0.90
<i>A. plumbeus</i>	9	1.60
<i>A. atroparvus</i>	1	0.18
AEDES		
<i>A. rusticus</i>	8	1.44
<i>A. berlandi</i>	35	6.34
<i>A. vexans</i>	10	1.80
<i>A. detritus</i>	3	0.54
<i>A. geniculatus</i>	20	3.60
<i>A. pulchritarsis</i>	5	0.90
<i>A. caspius</i>	9	1.60
CULEX		
<i>C. impudicus</i>	5	0.90
<i>C. hortensis</i>	2	0.36
<i>C. pipiens</i>	329	59.61
ORTHOPODOMIA		
<i>O. pulchripalpis</i>	18	3.27
CULISETA		
<i>C. fumipennis</i>	2	0.36
<i>C. annulata</i>	6	1.08
<i>C. morsitans</i>	1	0.18
<i>C. longiareolata</i>	47	8.50
URANOTAENIA		
<i>U. unguiculata</i>	2	0.36
TOTAL	553	

2-1. Anophelines

The data collected stresses the low proportion of Anophelines found. Out of 2.200 samples of water tested, only 51 (2.31%) has a positive result with regard to species of the *Anopheles* genus. With the exclusion of *A. plumbeus*, whose breeding places are confined to decayed parts of *Platanus*, *Ulmus* and *Quercus*, all the other species, of small vector capacity, were mainly found in small natural breeding places in the "Agro Romano", only rarely being observed in artificial breeding places. It proved equally obvious that the scarcity of anophelism is not only due to the changed hydrological conditions along the coastal strip, but also to the presence of *Gambusia* in many slow-flowing canals and waterways, especially at Fiumicino and along the whole coast from Ostia to Pratica di Mare.

2-2. Aedes

Breeding places of wood *Aedes* (*A. berlandi*, *A. geniculatus* and *A. pulchritarsis*) have been located even in the middle of built-up areas, but in limited number and therefore easily controllable.

A. caspius, *A. vexans*, *A. detritus* and *A. rusticus* have been observed all along the coastal strip. These are exophile species, but are markedly anthropophile, and their bites often cause a pronounced burning sensation and swelling. Their breeding places are to be found in natural ponds, neglected drainage canals, and temporary swamps after heavy rainfall, and their diffusion varies considerably from one year to the next. These are the species which often make a stay at the seaside resorts distressing in the summer.

2-3. Culex pipiens

This species is cosmopolitan in its distribution, and is a real plague - especially in built-up areas. We need only remember that this species accounted for about 60% of the total examples found, to realize how widespread it is in Rome. Its great diffusion is tied up with the fact that its larvae develop even in contaminated waters, its stenogamy and its autogenesis capacity. *C. pipiens* larvae have been found in the most varied of biotopes : septic tanks, street drains, rice-fields, ornamental fountains, cellars flooded with ground-water or contaminated waters and, with *Aedes*, in tree holes. At the beginning of our work, some suburban localities in Rome (Casale S. Basilio, Via Valmelaina, Via Donna Olimpia) were found to be infested by mosquitoes the whole year round, due to flooded cellars. Particular attention was centred on the study of this widespread and troublesome species, which is potentially harmful by reason of its virus-carrying capacities, in order to discover the best methods to combat it.

It is well-known that the double name *Culex pipiens*, Linnaeus comprises in reality a complex group of forms. Those found in Rome come under the heading *Culex pipiens autogenicus* as regards biological features (urban, autogenous, stenogamic, homodynamic and anthropophilic mosquito).

As in many other urban centres, this form becomes very aggressive in Rome houses at the end of the summer, usually biting at night and only becoming active in complete darkness. A small-scale breeding experiment was carried out with larvae taken from a cellar in Via L. Lotto (Rome) in February 1962, with the purpose of having larvae and adult examples available to test their behaviour in the face of the more common residual-action insecticides. Tests were carried out with material supplied by the OMS. Results observed at the larval stage were as follows :

- The death rate with DDT was 27% with mg 0,02/l, 100% death rate was obtained with mg 0,05/l.
- 29% death rate was achieved with mg 0,02/l dieldrin concentrate, with a rise to 95% using mg 0,1/l concentrate.
- Of the two phosphorus compounds tested, BAYTEX proved the more efficacious, a mg 0,008/l concentrate already causing a 94% death rate; malathion only produced a 99% death rate at mg 0,1/l concentrate.

Resistance tests carried out on adult insects bred in laboratories and nourished on sugar revealed an increase in DDT and Dieldrin tolerance, which was more marked in the winter season.

3 - PRACTICAL ACTIVITY OF ROME MUNICIPAL DISINFESTATION CENTRE

An overall total of 100 men are employed on pest control, under the direction of two M.D., P.H.E. and one malariologist. Eight squads, each formed of 3 men, are mainly employed on Culicidae control throughout the year, and are equipped with motor vehicles or trucks, pressure sprayers, motor pumps of various power (from 4 to 15 atmospheres) - see Fig. 2 - motor pulverizers and "Tifa" type smoke dischargers.

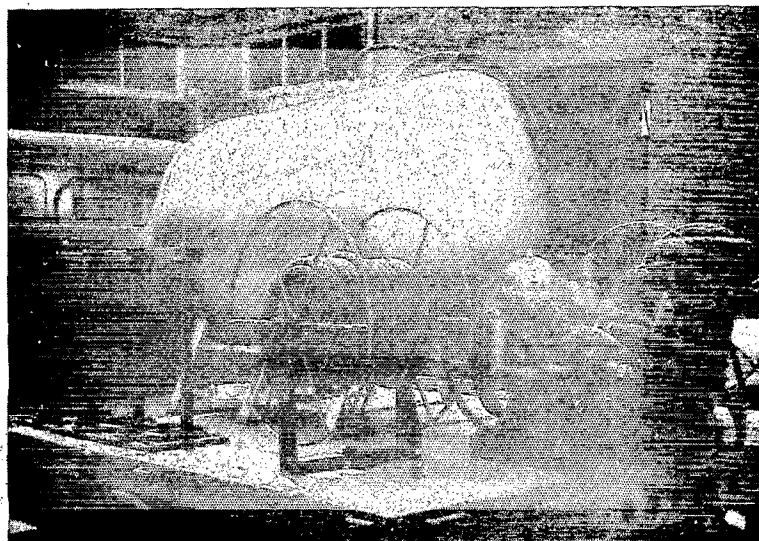


Fig. 1- 15 atmosphere motor pump for insecticide spraying.

Three squads work permanently in the "Agro Romano" (Ostia Antica, Fiumicino, Maccarese, Fregene and Palidoro), the others in the city and its suburbs.

The policy is to attain efficient control by locating and eliminating or disinfecting larval breeding places, bearing in mind the species being dealt with, and its susceptibility and vulnerability to the various biological and chemical means available. The unchanging rule is to entrust control in each zone to the squad that already knows its main breeding places, to avoid waste of time and fruitless labour.

3 - 1. Anti-larval campaign

3 - 1 - 1. Natural breeding places

Unkept ditches and drainage canals, borrow pits, natural pools and ponds produced by small springs are frequently breeding places for Anopheles. If the water in them is fresh, and the size of the breeding place is quite large, steps are taken to introduce *Gambusia*.

All known breeding places are checked in the spring each year, and fresh supplies of *Gambusia* are made to any that prove wanting. The results achieved are normally excellent and long lasting. During the last year an attempt has been made to extend this simple system to neighbouring municipalities too, and provisions were also made for the collection of *Gambusia* and their distribution to private persons upon request.

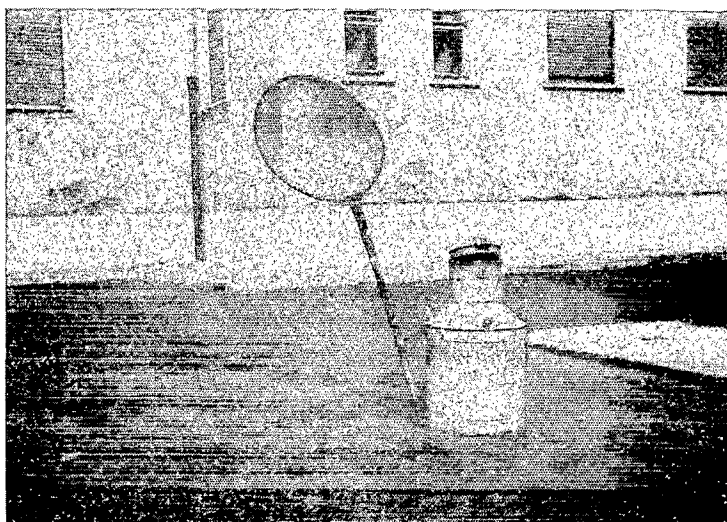


Fig. 2 - Fishing net and container for the transport of *Gambusia*.

3 - 1 - 2. Tree holes

Breeding places of *A. berlandi*, *A. geniculatus* and *A. pulchritarsis* are treated with the introduction of 2,5% wettable malathion dust. This treatment is repeated after 60 days when necessary.

3 - 1 - 3. Flooded cellars

There are a great number of these in the city itself and at Ostia Lido, and they are breeding places of *C. pipiens autogenicus*, that are active even in the winter months. Approximately every three months 2% Nankor 50 E (O-Odimethyl 0-2,4,5 trichlorophenylthiophosphate) in kerosene is spread over the surface of the water, and at the same time the interior of the cellar is sprayed with micronized dust (5% DDT, 1% Lindane, 0,5% Malathion) by means of a small motor pump. This combination has proved successful in keeping breeding places sterile for as long as six months. The existence of such flooding is naturally reported to the administrative authorities concerned, so that the breeding places are drained off.

3 - 1 - 4. Cesspools

These are often breeding places of *C. pipiens*, and are periodically disinfested with creosols. Given the large number of these breeding places and the necessity of frequent treatment (roughly every fortnight), the foreman in charge of the squad that discovers a breeding place reports it to the landlord concerned, so that he may collaborate in repeating the treatment, using material supplied by us.

3 - 1 - 5. Road Drains

In the winter months, they become the refuge of adult *C. pipiens* and the small pools that may be formed in them easily produce breeding place for the larvae of these insects. At the beginning of the spring, they are treated with a 2% Nankor 50 E in naphta spray, by means of a "Tifa" mobile smoke-discharging plant. (see fig. 3).

3 - 1 - 6. Street and Courtyard catch basins

These form the most numerous breeding places of *C. pipiens autogenicus* larvae in the



Fig. 3- Mobile smoke-discharging plant for the disinfection of drains.

city and suburbs, and set the hardest problem of all, since it is estimated that there are some 100.000 of them in the built-up area of Rome, each capable of holding about 50 litres of water.

Their importance as larval breeding places largely depends on the type of weather experienced during the season. In fact, when the summer is marked by frequent torrential rainfall, the water in the catch basins is continually changed, thus hindering larval-chrysalis development. On the other hand, if rainfall is scarce and infrequent, the drains only receive the water from street cleansing operations and become long-standing breeding places.

Various disinfecting treatments have been put forward, ranging from the oldest and simplest - the introduction of about 200 gms. of cresols into the drains - to the most modern: the introduction of rounds containing 50 gms. of dieldrin mixed with sand and cement, which have produced partial and short-lived results; the spraying of 2% Nankor 50 E in kerosene inside the drain sump by means of a small motor pump, having a larvicide and imagocide action at the same time; and the use of DDVP containers immersed in the water or fixed inside the catch-basins.

Sufficient experience has not yet been obtained as regards the results attainable by using DDVP. As regards the other means mentioned, Nankor 50 E in kerosene has enabled us to keep these breeding places sterile for up to 90 days.

3 - 1 - 7. Temporary pools

These occur frequently in the spring, especially at Fregene and other places along the coast and in the "Agro Romano", due to lack of dynamic drainage systems. They are breeding places of *C. pipiens* and, sometimes, of *A. caspius*, *A. vexans* and *A. detritus*. As these breeding places are of short duration, preference is given to treatment with cresols (see fig. 4).

3 - 1 - 8. Ornamental Basins

Save for exceptional cases when the larvae of 4 species (*A. melanocephala*, *A. maculipennis*, *C. pipiens* and *C. longiareolata*) have been found at the same time, the most frequent inhabitant of these breeding places is *C. longiareolata*.

It is preferred to carry out no disinfecting treatment whatever in such cases, since this

is a non-anthropophilic species only biting birds and batrachians. Moreover, it is an important competitor of *C. pipiens* and other species troublesome to man, in the larval stage.



Fig. 4- Disinfestation of temporary pool with cresol.

3 - 1 - 9. Domestic Breeding Places

These often represent serious problems because they make every other effort useless. Breeding places of every type and size are to be found, mostly inhabited by *C. pipiens*. In these cases, action is confined to emptying out the breeding place, no insecticide being used. Good results can only be obtained in this field by means of suitable training in matters of hygiene, and to this end a small pamphlet has been prepared, mainly for distribution at schools.

3 - 2. Adult insects control

This is looked upon as a supplementary control to be used only in coastal areas, and the "Porto" (Fiumicino) and "Castel Porziano" (Ostia) estates with extensive wooded areas. For this purpose, a motor pump capable of pulverizing considerable quantities of micronized dust based on 5% DDT, 1% Lindane and 0,5% Malathion is used (see fig. 5) or a smoke discharger for spraying 2% Nankor 50 E kérosène. Immediate good results are obtained, but they are short lived. The presence of built-up areas in a large part of the municipality does not allow this technique to be used on a wider scale.

3 - 3. Health and hygiene training

With the aid of School Medical Services, the Press and Radio and Television Services, the work so far achieved has been brought to the knowledge of the general public, who have been repeatedly urged to collaborate in mosquitoes control by reporting infested areas in good time, and eliminating small domestic breeding places.



Fig. 5- Spraying of insecticide dusts at Ostia Lido.

4 - CONCLUSIONS

The results achieved so far are encouraging. The more exact knowledge of the species of *Culicidae* present, the use of more efficacious control means and the improved training of personnel, have already made it possible to reduce the number of adult insects and the nuisance they cause to a tolerable level throughout the territory of Rome Municipality. It is not possible to document the results achieved from a medico-statistical point of view, as disease definitely caused by arbovirus have not yet been recorded in Rome. Reports of cases of primary encephalitis are at any event rare. Tests carried out in suburban houses have registered the efficacy of the treatments used (see table II).

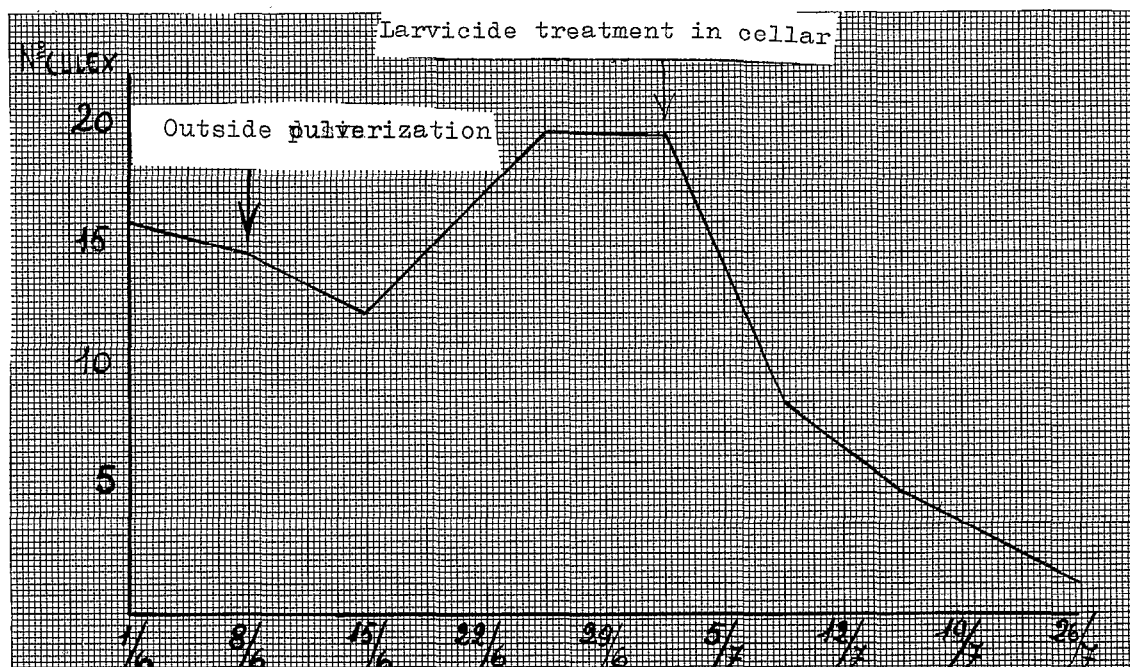
The persistent low density of Anophelines and the disappearance of *A. labbranchiac* exclude the possibility of a return of endemic malaria, even allowing for the presence of numerous sources of infection.

There is still much to do, and much more could be achieved with closer collaboration between Central Health Authorities and Local Authorities and the combined efforts of specialists in many fields (entomologists, chemists, toxicologists, microbiologists, ecologists, health experts and engineers).

The pest control must be considered a public service of great health and social importance, for it avoids the spread of infectious diseases and widely contributes to the attainment of a "Positive Health" condition - a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.

SUMMARY

After describing the entomological research to detect the species of *Culicidae* present in Rome and the results of resistance tests carried out on *C. pipiens* larvae and adult insects, the author surveys the various means employed in the anti-mosquito campaign and the results obtained.



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