The fulminating course and the luxuriant vegetations found post mortem are characteristic of infection by the *Staphylococcus aureus*, but the anatomical distribution of the lesions and absence of systemic infarcts made the diagnosis difficult.

[I am indebted to Lieutenant-Colonel A. G. Wells, D.S.O., R.A.M.C., Officer Commanding British Military Hospital (with Indian Wing), Mingaladon, for permission to submit this note for publication, and to Major F. A. R. Hacker, R.A.M.C., under whose care the case was, for the use of his clinical notes.]

CYANIDE FUMIGATION IN THE TROPICS:

By ERIC C. GILLES, L.R.C.P. & S., D.P.H., D.Sc.,

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**PART I.—DESTRUCTION OF BED-BUGS AND OTHER VERMIN IN BARRACK ROOMS AND OTHER BUILDINGS!**

Perusal of the literature reveals many methods recommended by different authorities for ridding buildings of bedbugs, roaches and other vermin, but most of them are successful only to a limited degree, as they lack power of penetration and often cause damage to material and fabrics; others again utterly fail in their purpose. The majority of methods used are in general only palliative, and of the numerous spray products, both liquid and powder, I doubt if any of them is successful in destroying the eggs, which require repeated treatment as new bugs hatch out. Formaldehyde gas has been recommended but has not met with universal acceptance, while the blow lamp used to disinfest the joints of metal structures, and the pouring of boiling water on wooden articles is only a waste of time and personal effort.

In the tropics where insect life is so prolific and buildings offer harbourage for bed-bugs in wooden floors, skirting boards, window frames, in cracks of walls and ceilings, complete eradication becomes a big problem, because many of the methods employed for their destruction do not kill the eggs or penetrate the cracks and crevices in which they conceal themselves beyond easy reach.

In Colombo cyanide fumigation introduced for the fumigation of ships proved exceedingly successful not only for the destruction of rats but for other forms of insect life in all stages of development found aboard vessels. Accordingly, it occurred to the writer to try out cyanide fumigation for the destruction of vermin in barrack rooms which in Ceylon are very heavily infested with bugs despite routine measures for their elimination with sprays, formaldehyde gas, blow lamps, etc. An experimental test was made on a section of the Echelon Barracks, Colombo, consisting of a two-storied concrete building with a tiled roof; it had a ceiling and a flooring of the
upper storey composed of boards; ventilation was by means of twenty-two glass windows and twelve doors of the venetian-shutter type.

The occupants of these barracks had all been provided with mosquito bell nets on circular cane frames suspended by a cord from the ceiling. This section was rather heavily infested with bugs and several complaints had been made by the men. The bed-bugs had not only infested the bed-clothes and bedding but by creeping up the mosquito curtains and the suspension cord to the ceiling, found the separations in the wooden boards there ideal for nesting and breeding; in fact the crevices in the wooden floors and separations between the window frames and the concrete masonry were all infested.

An opportunity was afforded to try out liquid HCN in this one unit, which consisted of 42,827 cubic feet of space to be fumigated. The entire block was evacuated by the men who left behind all their belongings. They sealed up efficiently the doors and windows of the building, making it more or less air-tight by pasting up all cracks and crevices with paper. This work of sealing was completed by noon, and fumigation commenced at about 2 o'clock in the afternoon. The belongings of the men left behind in the room were opened up; blankets, bedding, sheets, etc., were spread out on temporary lines drawn across the room, and after everyone had left the quarters, liquid HCN was introduced through one of the doors left slightly ajar, and afterwards sealed up. The dosage used was four ounces per one thousand cubic feet of space. The whole process of introducing the gas was over in about twenty minutes. Entrance to the building was blocked and posters placed to allow of no admittance, and thus it remained closed till the following day, the men sleeping that night in other quarters. Next morning at 9 a.m. the building was opened up and tests for the presence of HCN made by using methyl orange test paper. No trace of gas was detectable, so it was considered safe to enter. Though these barracks were exposed to the gas overnight, subsequent experiments have proved conclusively that the same dosage with only a four-hour exposure is sufficient to destroy all stages of insect life. None of the material exposed to the gas was in any way affected. The floor was littered with a fair number of dead roaches, lizards, spiders, and other insects.

More than a year has elapsed since the fumigation was carried out, and so far as it has been possible to ascertain no bugs have since reappeared. This is a clear indication that the dosage used was quite sufficient to kill both the bugs and their eggs, and the method is recommended as most effective in completely ridding barracks infested with bugs in the tropics. The old methods of spraying, flaming, etc., must give way to the greater efficiency of HCN, which is undeniably superior in every respect. The cost is not exorbitant, and though the gas is a deadly poison, with intelligent care by a responsible operator the risks are slight. There is no special difficulty about its use in the tropics, and one thoroughly
experienced worker with two reliable assistants can easily carry out successful fumigation with HCN.

**PART II.—DESTRUCTION OF BATS WITH CYANIDE.**

It may also be of interest to add here the results of another experiment with cyanide gas which gave equally satisfying results. As mentioned before, insect and rodent life in the tropics is so prolific that any building left unoccupied for even a short time is a silent invitation to vermin of all kinds to make it their new home, and so efficient and rapid is their means of communication that in a very short time the abandoned building is heavily invaded by these tenants. In addition, Ceylon has the problem of dealing with bats. Multitudes of them take possession of ruins, caves and deserted buildings. It can therefore be imagined in what condition a building, especially in the nature of a subterranean chamber, would be after a period of thirty years' disuse.

Such a building was called into service recently at Trincomalee, and when entry was attempted, apart from the musty noxious odour present, the persons who made the attempt found themselves pelted and battered as by a fusillade of machine-gun fire! An inconceivable population of bats was in occupation of the quarters, no doubt for the full period of occupancy, since guano covered the floor to a depth of thirty-two inches! The engineers detailed for work on this building could do nothing until this bat army had been exterminated, and they were at a loss how to proceed. At length they approached the Senior Medical Officer of the Ceylon Command.

In view of the fact that liquid hydrocyanic acid gas had proved so effective a short time previously in ridding barrack quarters of bugs, it was decided to gas the chamber to destroy the bats.

The building was kept open so that the bats, who are nocturnal in their habits, might return at dawn to their hiding place. At about 7 a.m. all entrances were hermetically sealed and the bat occupants of this long-abandoned building were unaware that a rapid and painless extermination awaited them. Advantage was taken of the ventilators on the roof through which, as well as an opening in the only door of the building gas was introduced, and the openings were immediately covered with jutesan and weighted down. Four ounces of gas per thousand cubic feet of space was the dosage, and as the rough estimate of space was 20,000 cubic feet, five pounds of liquid HCN was utilized. The gas was introduced at about 10 a.m. and retained until 2.30 p.m., when the roof ventilators and main door were opened and thorough airing permitted. Safe entry was possible about 5.30 p.m. the same day. It is indeed difficult to describe the sight which met the eyes of the spectators. On the deep layer of guano a blanket of dead bats lay as they had fallen; along the sides of the walls and dangling from the ceiling and roof, so closely packed as to form a dense cover, they hung as death overtook them.

The fumigation was entirely successful and the engineers were pleased
to be able to proceed with their duties, after clearing out the dead bat colony and guano. It was estimated that about forty to fifty thousand bats were thus destroyed.

These results are recorded in the hope that they may be of value to others faced with similar problems in other parts of the tropics. As an efficient, rapid and painless method of dealing not only with vermin but all forms of life, this experiment was good proof, for not only were the bats destroyed but also the parasitic forms of insects which thrive on them.

Numerous objections have been raised against the routine use of cyanide products, especially liquid HCN, as a means of eradicating vermin from buildings in the tropics. To my mind, these objections are over-stressed, due, I think, to lack of experience and want of application to preliminary details preparatory to the fumigation. It is true that liquid HCN like all cyanide products is highly toxic, but this makes it all the more valuable for the purpose. Long experience with liquid HCN leads me to consider it the most effective and penetrating fumigating agent I have used; it has the advantage of speedy application, cleanliness, with no damaging effects on furnishings or merchandise, of leaving no odours or having deleterious after-effects, and most important of all, it can be applied from outside the building or quarters to be fumigated so that the risk to the operator is greatly diminished. Only those who have carried out successful cyanide fumigation can thoroughly appreciate the results obtained.

To those contemplating a fumigation, doubtless the question of cost is of foremost consideration. The actual cost of the HCN gas used in the two experiments cited was as follows:

<table>
<thead>
<tr>
<th></th>
<th>Capacity cubic feet</th>
<th>Cost of gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrack room</td>
<td>43,000</td>
<td>£3 12s. 8d.</td>
</tr>
<tr>
<td>Bats at Trincomalee</td>
<td>20,000</td>
<td>£1 13s. 8d.</td>
</tr>
</tbody>
</table>

In the event of the Army employing this method of disinfection, there would be a reduction of 25 per cent on the above cost. The only extra items to consider are the applicator, hose, spray, connexions, etc., all of which may be procured for about £5, becoming permanent equipment. Gas masks, of course, are necessary, and the ordinary Army service gas mask equipped with suitable filter canister will give the necessary protection. There appears to be a general impression in the Army that fumigation with HCN is best handed over to some firm of professional fumigators. This is hardly necessary, for there is no reason why men of intelligence with a due sense of responsibility cannot be chosen from the personnel of the R.A.M.C. to be trained for this work, thereby causing considerable saving in public funds.

Both of the experiments cited were carried out through the courtesy of Colonel R. M. Dickson, M.D., O.B.E., S.M.O., Ceylon Command, and with the consent of Dr. R. Briercliffe, C.M.G., O.B.E., Director of Medical and Sanitary Services, to both of whom I am extremely grateful for affording me these opportunities of using liquid hydrocyanic acid for the first time.
in the Far East. I also wish to thank Messrs. Shaw, Wallace and Company for making available the liquid HCN for these experimental purposes, as well as for all the necessary equipment supplied.

**Echoes of the Past.**

WAR EXPERIENCES OF A TERRITORIAL MEDICAL OFFICER.

By MAJOR-GENERAL SIR RICHARD LUCE, K.C.M.G., C.B., M.B., F.R.C.S.

(Continued from p. 66.)

CHAPTER X.—THE WESTERN FRONTIER.

On reaching Alexandria the Headquarters of the 2nd Mounted Division proceeded at once to Cairo. The remnants of the original brigades of the 2nd Mounted Division were already assembled in the camp close to the Pyramids at Mena, which had been occupied the winter before by the Australian Divisions, and were busy re-organizing. They had picked up their horses and were collecting new equipment and reinforcements. The Divisional Headquarters moved out to Mena on December 29, and established itself in the Annexe of the Mena House Hotel.

The two field ambulances which we had taken to Suvla, the 2nd South Midland and the London, were already at Mena. The other two, which had been left behind, were with the Western Frontier Force, now operating against the Senussi on the coast to the west of Alexandria. The Scottish Horse and Highland Mounted Brigades had not yet arrived from the Dardanelles.

It was arranged that as soon as their equipment was complete the brigades were to move down in succession to Salhia, a desert camp not far from the north end of the Suez Canal. The 1st South Midland Brigade was ready first and moved off to Salhia on January 3, taking with them one section of the 2nd South Midland Field Ambulance.

Of the Notts and Derby Mounted Brigade the Derbyshire Yeomanry had gone to Salonica some time before and taken with them part of the 1st South Midland Field Ambulance, and it was now decided that the remainder of this brigade should follow them. They left about January 14, and took with them a section of the London Mounted Brigade Field Ambulance which, with the section already there, would make up a complete field ambulance for the brigade. The re-organization of the other two brigades took some little time and before it was completed an alteration of plan was made which resulted in the Division being broken up.