Louse Powder Test at Esbet Ramses II

Esbet Ramses consists of a small cluster of homes lying just west of the Colossus of Ramses which lies in supine majesty beneath a protecting canopy on the site of the Ancient Egyptian city of Memphis. Officially Ramses belongs to the jurisdiction of the nearby village of Mit Rihena where the USAFC began its experimental vaccinations early in Feb. Esbet Ramses was chosen under the mistaken impression that it is a village of 100 ± people. The first survey gave 55 persons but these held dwindled to about 40 by the time we started to work on Louse Powdering.

Louse Powder Myk. – application to inner seams.

Feb. 7th – JCS and FLS working. Visit of Sadek and Assis. Clothes of 37 people examined and powdered.

Feb 10th – Examination of clothes of 34 people by JCS FLS and CMW showed 5 adult lice on garments of 5 women. No complaints of dermalitis on body or scalp.

Feb 13-14 – Examination of clothes of 29 people by JCS FLS CMW showed 9 adult lice on six people and 69 immature forms* on 12 people. Continued action of larvicide on young forms is suggested by finding ① dead larvae on the garments of 5 persons with living larvae and ② on the garments of 12 persons in which killing of second generation had apparently been complete, ③ Visible traces of powder along the seams of many garments. (* This figure is incomplete since 2 garments of two cases in which uncontrolled hatching was occurring were not fully examined.) // Nymphs of head lice were found in one case.

Feb. 17 and 21. Clothes were examined by CMW of 32 people on Feb 17 and 12 adult lice found on 10 people; 98 immature forms were found on the clothing of 19 people. Larvae were found on 10 people not having adults; only one adult was found on person not having larvae. On Feb 21 the clothing of 13 persons was examined, the 12 of the negatives from the 17th and one other. 5 adults were found on two people, and 15 larvae on 4 people. Eight persons were found larvae free! 2nd Powdering given on 21st to 33 persons.

Feb 25. Clothing of 14 examined by CMW and only 2 found infested, one with 2 adults and one with 1 adult and 1 late larva. Traces of powder were visible on 13 of 14 person's clothing and adult and late larva on second case, though living were not active.

Feb 28. Clothes of 28 people examined by JCS CMW and FLS finding 6 adults on 5 persons and 10 larvae on 6 persons. No evidence of infestation was found on 19 persons.

March 7th. JCS CMW FLS examined and powdered (3rd time) clothing of 25 persons. Only 7 adult lice were found on 6 persons and only 6 immature forms on five persons. 17 persons were apparently free of infestation.

March 15th. JCS, CMW and FLS examined 29 people: 12 persons found infested. 12 larvae on inner garments 8 persons 1 larva on outer garment of another person. 17 adults on inner garments of 9 persons and 2 adults on 2 other people. People c larvae 9, c adults 11. Total persons infested 14. These results are disappointing coming as they do one week after the third powdering which was expected to almost do away with young forms in this group

Table I

B = Body, H = Head. "POWDER" is noted at Feb 7, Feb 14–21 / Feb 21 and Mar 4. Circled values are written as (n).

No.	Sex	Age	Feb 7 B	Feb 7 H	Feb 10 L	Feb 10 A	Feb 13-14 L	Feb 13-14 A	Feb 14-21 L	Feb 14-21 A	Feb 21 L	Feb 21 A	Feb 25 L	Feb 25 A	Feb 28 L	Feb 28 A	Mar 4 L	Mar 4 A	Mar 15 L	Mar 15 A
1	M	47	$+^{2}$	-	0	0	0	0	0	0	(1)	0	0	0	0	0	(1)	(1)	(1)	(1)
2	F	28	$+^{1}$	+	0	0	0	0	0	0	0	(4)	0	0	0	0	0	0	(1)	(1)
4	M	12	$+^{3}$	-	0	0	(11)	(1)	(24)	(1)	+		0	0	0	(1)	(1)	(1)	(1)	(1)
5	M	9	$+^{3}$	-	0	0	(15+)	0	(7)	(1)	+		0	0	0	0	0	0	(3)	(2)
6	M	7	$+^{2}$	-	0	0	(9+)	0	(14)	0	+		0	0	(1)	0	(1)	0	0	(5)
7	F	13	$+^{2}$	+	0	0	(8)	0	(1)	(1)	+		0	0	(1)	0	0	0	(2)	(1)
8	F	5	$+^{2}$	+	0	(1)	(9)	(1)	0	0	0	0	0	0	0	0	(2)	0	0	0
9	F	2	$+^{4}$	+	0	0	0	0	(2)	(1)	+		0	0	0	0	0	0	(1)	0
10	F	80	$+^{2}$	+	0	(1)	(2)	(1)	0	(1)	+		~~0~~	~~00~~	-	-	-	-	-	-
11	M	40	$+^{4}$ SICK		-	-	SICK		SICK		SICK		HOME TODAY		-	-	+	+	0	0
12	F	35	$+^{4}$	+	0	0	(2)	(4)	(2)	0	+		(1)	(1)	(1)	(1)	0	0	[illegible]	(3)
13	M	3	$+^{4}$	+	0	0	0	0	(3)	0	+		-	-	0	0	0	0	(1)	0
14	F	12	(60+) SICK		~~0~~	~~0~~	SICK		SICK		0	0	-	-	0	0	-	-	0	0
15	F	7	$+^{4}$	+	0	(1)	0	(1)	(8)	(1)	+		-	-	(4)	0	(1)	(1)	0	0
16	F	3	$+^{3}$	+	0	0	(2)	0	(14)	(1)	+		-	-	4	0	0	(1)	(2)	(2)
17	F	85	$+^{4}$	+	0	0	0	0	(2)	(1)	+		0	0	0	0	0	(1)	0	0
18	F	65	$+^{4}$	+	0 0	(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	M	45	0	0	0	0	0	0	(2)	0	+		0	0	-	-	0	0	0	0
20	F	40	$+^{1}$	+	0	0	(1)	0	(1)	0	+		0	0	(2)	0	0	0	0	0
21	M	12	0	0	0	0	0	0	0	0	0	0	(2)	0	0	(2)	0	0	0	0
22	M	1	$+^{3}$	+	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
23	F	8	$+^{2}$	+	0	0	0	0	(1)	0	+		-	-	0	0	0	0	0	(1)
25	F	26	$+^{1}$	+	0	0	-	-	0	0	(1)	0	-	-	-	-	-	-	-	-
26	F	1	0	-	0	0	-	-	[illegible]	(1)	+		-	-	-	-	-	-	-	-
27	F	85	$+^{4}$	+	(1)	0	(1)	0	0	0	0	0	~~0~~	~~0~~	0	0	0	0	0	(1)

MAR 12 L	A.	
(1)	0	Family 1 Heads of 1, 4, 5, 6 shaved. First days dusting was done
0	(4)	at the house of the caretaker but the women on Feb 10th and all
(5)	(3)	persons on succeeding days were handled at home of Fam-
0	(15+)	ily 1.
(7)	(3)	
(6)	(1)	
(2)	(2)	
(2)	(4)	
–	–	
0	0	Family 2. #s 11 and 14 sick c typhus; to hospital on Feb 7. Virus from 14 14 returned on
(1)	0	21st apparently free of lice: 11 returned, louey, on the 25th but was powdered
0	0	only on the 7th. #11 undoubtedly a source of reinfestation of
0	0	family during 10 days. 60 lice from clothing of case
0	(1)	#4 on Feb 7th at Hospital.
0	0	
0	(1)	
0	0	Family 3. Evidently some advantage to living alone.
0	0	Family 4. No active lice found on clothing of #s 19 and 21 but nits on
–	–	clothing of 21.
0	0	
(1)	0	
0	0	
–	–	
–	–	
0	0	

				1st Count	3 Days after 1st Powder	One week after 1st Powder	10 days after 1st Powder	2nd Count	4 days after 2nd Powder	One week after 2nd Powder	2nd Count	One wk after 3rd Powder	2 Weeks after 3rd Burd
				FEB 7	FEB 10	3eb 13/14	Feb 17	7eb 21	7eb 25	3eb 28	MAR 7	MAR 15	MAR 22
		B	H	L A	L A	L A	L A	L A	L A	L A	L A	L A	L A
29 F	35	4	+	0 0	0 0	0 0	0 0	④ ①	- -	- -	0 0	0 0	- -
30 M	5	3	+	0 0	• 0	③ 0	+	- -	0 0	⊖ ⊖	0 0		- -
31 M	2	3	+	0 0	0 0	0 0	0 0	0 0	- -	0 0	0 0	0 0	0 0
32 F	9	3	+	0 0	0 0	0 0	0 0	⑲ 0	- -	0 0	0 0	0 0	① ①
35 M	50	3	0	0 0	⑨ 0	① ③	+	- -	0	① - -	- -	- -	- -
36 F	45	1	+	0 0	- -	0 0	0 0	- -	① 0	0 ②	0 0	0 0	0 0
39 M	19	3	0	0 0	0 0	② 0	+	- -	0 0	- -	- -	- -	- -
40 M	10	2	0	0 0	0 ①	① 0	+	- -	0 0	- -	① 0	0 0	
41 F	2	1	+	0 0	0 0	② 0	+	- -	0 0	0 0	0 0	0 0	

TABLE II

	Ex	Persons Pos. L	Persons Pos. A	Forms Found Number L	Forms Found Number A	Forms
3 & 7	34	32	32	+	+	+++
10	32	1	4	1	4	5
1WK-13	29	11	6	63	9	72*
2WK 17	32	19	10	97	12	109*
2WK 21	13	4	2	15	5	20
25	14	2	1	3	1	4
1WK-28	23	6	4	10	5	15
2WK 4	25	5	6	6	7	13
1WK-15	29	10	9	17	16	33
2WK-22	26	9	10	26	38+	64+

(* The numbers given for the 13th and 17th of FEB. are incomplete since only part of some garments (heavily infested in comparison with others) was examined.)

In passing it may be noted that on Feb 7th 60 lice were picked with tweezers from the clothing of Reinat Case #14 for the isolation of virus.

ON MARCH 22, COUNT ON ONE CASE WAS GIVEN AS 15+.

① NOTE THAT EXAM OF FEB 21 WAS LIMITED TO NEGATIVES OF FEB 17TH.

March 22 JCS and CMW examined clothing of 26 persons 14 days after Bordering. 23 Larvae or Pupae garments of 4 persons and 30+ adults on clothing of 8 persons 3 young forms on outer clothing of 3 persons and 5 adults on outer clothing of 4 persons. New Eggs seen as well as ~~Family 5~~ freshly fed young larva. 13 of 26 persons infested

DISCUSSION: A REARRANGEMENT OF DATA OF TABLE II FOLLOWS AS TABLE III:

	PERIOD AFTER DUSTING									LICE		
	3 TO 4 DAYS			ONE WEEK			TWO WEEKS			3-4	ONE	TWO
DUSTING	EX	cL	cA	EX	cL	cA	EX	cL	cA.	DAYS	WEEK	WEEKS
FIRST	32	1	4	29	11	6	33	13	12	5	72+	129+
SECOND	14	2	1	28	6	4	25	5	6	4	15	13
THIRD	0	—	—	29	10	9	26	9	10	—	33	61+

The results of the 3 day examination of clothing after the First Dusting indicated, considering the great intimacy of contact with villagers from mitkihena that the louse kill had been almost perfect. The absence of young forms indicated that killing power continued for 48 hours or more. Examination at the end of the week however showed many young forms and indicated insufficiency of ovicidal action and too short persistance of killing action in clothing to get all young forms. From these results it was concluded that by using a 14 day interval between dustings it should be possible to get almost total kill after not more than 3 applications. The second application of powder gave results in keeping with this expectation: the 3 day count on 14 people was low; the one week count on 27 people was better,

Table IV

One Garment Index:

	Garment - From skin outwards. First	Second	Third	Fourth
Feb 10	1	2	2	0
13	9	4	0	0
17-21	24	2	2	0
25	2	0	0	0
28	5	1	1	0
MAR 7	6	3	0	1
MAR 15	11	3	—	—
MAR 22	10	6	—	—

Table V

Infestations (persons) missed by examination of first garment only:

	2	3	4 or more
Feb 10	0	4	4
13	2	0	2
17-21	1	0	1
25	0	0	0
28	1	0	1
MAR 7	1	1	2
MAR 15	1	1	2
MAR 22	2	1	3

There is some reason for thinking that most of the infestations missed by 1st garment inspection are "pick-ups" from off the garments. On Feb 10th, 3 days after the first powdering, 4 of 5 infestations found were on outer garments, and consisted of one adult each. On the 25th, 4 days after the second powdering, when the total lice in bedding etc must have been greatly reduced, no infestations of this type were found. In any case evidence indicates that only very light infestations will be missed by doing only inner garments.

than that following the first dusting and the zero count following the second dusting gave grounds for the hope that the 3rd treatment would finish the job since there was no increase between one and two week counts and no evidence of active breeding. The small number of larvae found may very well have come from chance contaminations. The period of two weeks seemed to have been adequate to let most of nits hatch out and yet not long enough to let those which hatched lay eggs for a third generation. No 3 day count was made after the 3rd treatment but the one week and two

week counts show that the 2nd treatment failed to check the infestation — increasing infestation was apparent.

April 5. CMW and JCS made 4 week count (after 3rd dusting: ~~28~~ 24 Persons ex: ~~14~~ 11 with larvae, ~~17~~ 16 with lice.

April 8. JCS and CMW decide to test out theories for failure of dusting to give desired results: ① that alteration in method of application may have altered effect and ② that re-infestation from immediate surroundings, bed, etc, may be serious. ③ that variation in shipments of Dec and Feb may be responsible. ¶ All inhabitants of village had heads, beds, bedding and clothing powdered. (All but 1 person sleeping in village, was treated. Work was done house to house.) 60 cans (120 oz) were used on 34 persons; the rubber sheet "poof" technique was used on clothing. Request made not to wash clothing during coming two weeks. ¶ Powder from Feb 9th NYH shipment was used on four children of #1 Family for special observation.

April 12 – JCS & CMW Four day counts at Ramuell: 28 Persons, 14 with lice: 10 with larval forms. Clearly apparent that "poof" technique with present powder is not equal to same technique and powder in Feb. // 3 children remain heavy infestations; ① treated today with sprinkle + poof ② with seams + poof + ③ seams only.

April 15th. JCS + CMW.: 30 Persons, 16 with lice, 12 c larvae. Children in Special Test all heavily infested. 4 Children given special test with different Powders of both Dec + Feb.

April 17 – No change in garments of 4 children.

APR 21 - JCS CMW Children dusted 1 with Feb Lot 80, other with Dec Lot 04.

April 22 - JCS CMW - Methyl Bromide application to 32 People - Counts on 31 People, 24 c lice, 20 c larval. Tests on Bentlee and Feb lots show loss of potency.

April 26. JCS CMW: 28 counts: 16 with lice, 12 c larval.
May 4th JCS CMW and FLS: 30 counts: 19 c lice, 14 c larval.
May 11th JCS CMW and FLS.: 31 counts, 22 c lice, 21 c larval.

Discussion:

Table VI

		EXAMINED.	WITH LICE	WITH LARVAE	WITH EGGS
POWDER FEB 7					
3 DAY	FEB 10	32	5	1	0
1 WK	FEB 13-4	29	13	11	5
2 WK	FEB 21	33	25	22	4
POWDER FEB 21					
4 DAY	FEB 25	14	2	1	0
1 WK	FEB 28	28	9	6	0
2 WK	MAR 7	25	8	6	0
POWDER MAR 7					
1 WK	MAR 15	29	12	9	0
2 WK	MAR 22	26	13	9	2
4 WK	APR 5	24 28	16 19	11 14	6 7
POWDER APR 8					
4 DAY	APR 12	28	14	10	3
1 WK	APR 15	30	16	13	6
2 WK	APR 22	31	23	20	10
METHYL BR. APR 22					
4 DAY	APR 26	28	16	12	6
12 DAY	MAY 4	30	19	15	5
19 DAY	MAY 11	31	22	21	12
26 DAY	MAY 19	30	25	22	16
METH + TALC MAY 18					
1 DAY	MAY 19	28	11	10	3

First powder killed almost all lice and some eggs but extensive hatching began before the end of the first week. Second powder got most of reinfestation and little or no hatching ensued during the following two (3) weeks. Third powder had some effect but much less than first two and 4th Powder which was the most thorough of all was a dismal failure. Methyl Bromide results are bad but will be discussed under Biden Report.

May 18. CMW JCS and FLS. counts plus powder, homemade myf with 325 mesh Talc. Powder seemed very

fluffy to use but one day killing will have to be determined since immediate killing does not occur. <u>May 14.</u> Counts by Cmu-JCS-FD. Eleven positives in 28 persons. (Many lice found look anemic. Does this indicate late killing?) 31

See FINAL REPORT- LOOSE LEAF BOOK.
(In Typhus, Egypt, file, No. 6)

Apparently any killings made [illegible] have been [illegible]
Much more on [illegible]

III

Louse Powder Studies. Outline for Log Feb 12 1943

Effect on ① Free living forms } ⓐ Body lice
② Eggs } ⓑ Head lice

modified by Clothing

① Cotton
② Wool
③ Oriental
④ Occidental

} ⓐ as to killing of lice
} ⓑ as to production of dermatitis

Will powder kill lice in hair of both men and women? What about cloth braided in coarse hair?

Questions of Special Interest

① How fast will louse powder alone bring down louse infestation to point below threshold of typhus transmission?

② Will rapid destruction of lice cause immediate cessation of transmission or must some substance be added to powder which will kill rickettsia on clothing and in louse feces?

③ If powder kills free living forms but not eggs, when should second application be made to get the maximum results on the next generation before further egg laying can occur?

④ How many applications of powder and at what intervals must be used to guarantee complete delousing of an isolated individual? Of an isolated closed group population?

⑤ How rapidly can mass infestation be reduced by mass application of or distribution of powder to entire population by inspector or nurse working from house to house?

⑥ How rapidly can thorough application of powder render refugees, or other infested and infected groups innocuous to other groups with which they mingle?

⑦ What is maximal result to be obtained when everyone in a community gets a single application of powder?

⑧ How frequently must powder be applied for safety when large percentage of population is powdered? when minimal portion of population is powdered?

⑨ What index of infestation can be used to get rapid survey of infestation? Examination of more children?

⑩ Are the characteristics which cause a powder to pack when shaken the same as those which

favor its clinging to garment fabric?

(11) How should powder be applied? Shaker, powder blower, envelope or fluffing in the garment itself?

(12) How combine greatest efficiency with economy in the use of the powder?

(13) Can powder be perfumed to make it more attractive and to facilitate its recognition on re-examination?

(14) What is effect of powder on other vermin especially fleas? Bed bugs?

(15) Will head lice reinfest body if body lice are removed, and vice versa?

(16) Can Head Lice transmit Rickettsia?

Many of the questions cited overlap and answers to some will come in the course of tests carried out to answer others

IV

Answers and Partial Answers. May 31 43

Fully effective Myk makes a pretty complete kill and has some ovicidal action as well as some delayed action in killing young as they hatch.

Myk can be used on heads for head lice without danger.

① At Bidsa very little typhus occurred after the 16th or 17th days after the first mass dusting.

② Apparently killing of lice rather than killing of rickettsia in feces is important in blocking epidemic wave.

③ Undetermined: 14 days has been used but possibly 10 days would be better.

Questions for North Africa:

1. Are local rodents susceptible? Monkeys?
2. Natural flea infections with epidemic virus?
3. What species of flea can transmit rickettsia?
4. Does vaccinated case which contracts typhus circulate virus?
5. Does perforation affect lice unfavorably.