

THE MICROSCOPICAL EXAMINATION OF THE DISCHARGE IN ONE HUNDRED CASES OF MIDDLE EAR SUPPURATION, WITH AN ANALYSIS OF THE RESULTS, HAVING SPECIAL REFERENCE TO THE PRESENCE OF TUBERCLE AND "ACID-FAST" BACILLI.*

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This investigation was undertaken not with the view of making an exhaustive bacteriological search, but chiefly with the object of testing the value and reliability of microscopical examination for acid-fast bacilli available under ordinary circumstances.

The sources of the material were for the most part patients who had not previously undergone any special treatment, and although many of them afforded family and personal evidence of tuberculosis, they were not perfectly selected for that reason, but were taken in the ordinary course of out- and in-patient practice at the Central London Throat and Ear Hospital, together with a few private cases. Mr. St. George Reid, the bacteriologist, kindly co-operated in verifying the morphological characters of the micro-organisms.

Collecting the Material.—Having experienced the unreliability of scrapings taken from the superficial regions of the auditory meatus, the discharge was always taken from the deepest available part, as near as possible to the diseased area. In some instances the granulations themselves, with the pus and débris, were triturated with a 2 per cent. solution of sodium sulphate, and centrifuged before staining.

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Age—Under 1 year	-	-	-	-	2
2 to 6 years	-	-	-	-	6
7 to 14 "	-	-	-	-	21
15 to 21 "	-	-	-	-	29
22 to 31 "	-	-	-	-	18
32 to 51 "	-	-	-	-	14
52 to 62 "	-	-	-	-	1

Sex—Equal in number.

History of Phthisis, family or personal - 42

Acid- and Alcohol-fast bacilli - - 24

B. T. (presumptive) - - - 17

Pseudo-B. T. - - - 7

Of the 17 B. T., 12 had history of phthisis.

" " 5 had no history of phthisis.

Of the 7 P. B. T., 5 had history of phthisis.

" " 2 had no history of phthisis.

Squames and Pus Cells present together - 41

Squames alone - - - - 21

Pus alone - - - - 38

Bacteria:

Staphylococci - - - - 41

Diplococci - - - - 20

Streptococci - - - - 7

Bac. proteus vulg. - - - 14

Mic. tetrag. - - - - 4

Bac. coli. - - - - 3

Gonococci - - - - 3

Bac. subtilis - - - - 2

Aspergillus nig. - - - - 1

Leptothrix - - - - 1

Diphtheria (Klebs-L.) - - - 1

Yeasts - - - - 1

Routine Staining.—The discharge was removed with a small curette, squeezed between sterilized cover-glasses, and fixed by heat. After boiling in carbol fuchsin for three minutes the smear was placed in 25 per cent. sulphuric acid until all color had disappeared; but if on washing with water the color reappeared the acid bath was repeated. After further washing in water, if apparently colorless, it was soaked in absolute alcohol for five minutes counterstained with

methylene blue, washed, dried, and mounted in xylol balsam.

Although this process may be carried out while the cover-glass is held by Cornet's forceps it will be found that the details can be more thoroughly and as quickly performed in a test-tube, using a liberal supply of solutions.

Specimens from the same cases were also stained by Gram's method, which proved more reliable than methylene blue as a general stain. They all resisted the action of 5 per cent. solution of tartaric acid after prolonged soaking.

SYNOPSIS OF TABLE OF RESULTS.

On referring to the table (pp. 6-8) it will be seen that the cases were all suffering with chronic suppuration of the middle ear with the three following exceptions:

No. 50 was one of chronic non-suppurative disease of the middle ear in a patient suffering with pulmonary tuberculous.

No. 52 was that of an infant ten months old suffering with mastoid abscess and a discharge of four days' duration, under Dr. Jakin's care. The abscess and discharge both contained gonococci.

No 76 was also that of an infant twelve months old with a discharge of five days' duration. This also contained gonococci.

It will be seen that in twenty-four cases bacilli which resisted acid and alcohol were present. Of these seventeen conformed to the morphological characters of the bacillus of tubercle, and, further, were accompanied in twelve instances with either a personal or family history of tuberculosis. These are described as presumably genuine tubercle bacilli. The remaining seven cases showed bacilli varying in several respects (size, shape, etc.) from the orthodox features, although affording the correct staining reactions, and are grouped as *Pseudo-tubercular*, as suggested by Pappenheim. In these also there was a history of tuberculosis in four cases. The number of bacilli present in each smear varied considerably, from twelve in each field to less than a dozen in a whole smear.

We now know that all acid-fast bacilli are not necessarily tubercle, and in considering their significance it may be well to enumerate some of the chief non-tubercular acid- and alcohol-fast bacilli which have been reported.

1. *Smegma bacillus*.—This is acid-resisting, but is readily bleached by alcohol—less so by acid. It is smaller than that of tubercle, and is said to be found only on the male genitals.

2. *Leprosy Bacillus*.—This may be disregarded in the present investigations, owing to its rarity in this country.

3. *Timothy and other Grass Bacilli*.—Resist both acid and alcohol, but in oculation experiments have proved negative.

4. *Lustgarten's Bacillus of Syphilis*.—The identity of this bacillus has not received satisfactory confirmation. It, however, is easily bleached by acid—less so by alcohol.

5. *Butter Bacillus*.—This is probably identical with a grass bacillus.

6. *Bacillus of Pulmonary Gangrene*.—This has been described by Pappenheim* as a *Pseudo-tubercular bacillus*, while Fraenkel† attributes its resistance to acids, to the putrefactive changes being rich in fatty acids, etc.; for when occurring in sweet sputum they give up their stain readily.

7. Lubarsch‡ also found similarly selective bacilli in: (a) Purulent bronchitis; (b) bronchiectasis; (c) abscess near hip-joint; (d) sebaceous cysts; in all of which cases inoculation results were negative.

8. Folli§ found acid-fast bacilli in three out of six cases of non-tubercular pulmonary gangrene. He observed that 5 per cent. solution of tartaric acid, while genuine tubercle bacilli required twenty minutes. This reaction I have not been able to confirm, as already mentioned.

In addition to these, there are many others which are referred to in the appendix.

*Pappenheim: Brit. Med. Jour., June 14, 1902, Epitome.

†Fraenkel: Brit. Med. Jour., June 14, 1902, Epitome.

‡Lubarsch: Deut. Aertz. Zeit., October 15, 1901.

§Folli: Rif. Med., August 27, 1901.

Thus we have evidence that many bacilli exist which may be mistaken for tubercle, and we must not be too ready to accept their identity, whatever their source may be.

This investigation has revealed another possible source of error. In about 60 per cent. of the preparations epithelial squames formed a most striking feature; they retained the fuchsin to a remarkable degree, in spite of prolonged treatment by acid and alcohol. It was noticed that the older the squames the more vividly they retained the fuchsin, the younger ones being paler, whilst the most recent of all being unstained with fuchsin, but readily selecting the methylene blue. This property is probably due to the increase of keratin and fatty substances, the result of degenerative age-changes in the cell, and supports Fraenkel's suggestion that the fuchsin selecting and retaining power of some bacilli is due to the degeneration products and fatty acids of putrefaction.

These cells often break up into small, irregular shaped rods and granular clumps, which may be readily mistaken for micro-organisms of the acid-gas group.

They are of still further interest in possessing a diagnostic value, since if the smear be taken from the deepest part of the ear they afford strong presumptive evidence of cholesteotoma, especially, when, as not unfrequently happens, they are more numerous than pus-cells. They are invariably accompanied with a distinctive sour fetor—that of decomposing epidermis, probably due to fatty acids and sulphur, in marked contrast to that of bony necrosis, which has more the character of phosphorus.

Cases of Special Interest.—No. 15 is that of a female with a strong family history of tubercle, four having died from phthisis. In addition to suffering with pulmonary tuberculosis, she is nearly blind with double optic neuritis, which Mr. Treacher Collins attributes to a retrobulbar tubercular lesion. She has suffered with suppurative discharge from both ears for seven years, in which I have found bacilli, on each of several examinations. The sputum afforded similar results.

No 50 was one of chronic non-suppurative middle-ear dis-

ease of eight years duration. There being evidence of some accumulation in the right ear, Dr. Dundas Grant performed paracentesis of the membrane, evacuating a few drops of inspissated matter, which contained tubercle bacilli. His sputum afforded abundant evidence of the same bacilli.

Gonococci occurred in three cases, two of which were infants and one was a male aged thirty-nine. The presence of this organism is not without interest, especially during infancy.

In No. 74 tubercle bacilli were found not only in the aural discharge, but also in the pus of the cerebral abscess, operated on by Dr. Dundas Grant. She had a strong family history of phthisis and was much emaciated, but made an excellent recovery.

Conclusions.—This investigation shows that acid- and alcohol-fast bacilli are demonstrable in a large proportion of chronic purulent ear discharge.

That in seventeen cases they were presumably tubercle bacilli, in so far that they conformed to the recognised morphological and staining characters and were for the most part associated with reliable clinical evidence of tuberculosis.

That in seven (pseudo-tubercle bacilli) cases, while conforming in a greater or less degree to the staining requirements, they were morphologically unlike tubercle bacilli, yet five of them had either a family or personal history of phthisis

That success in their demonstration in any great measure depends upon the methods of collecting and staining together with perseverance in search.

That in the peculiar selective action of the squames in retaining the carbol fuchsin—a property specially attributed to certain bacilli—we have at once a possible source of error in diagnosis and an explanation of the peculiar affinity of other bacilli for fuchsin.

Column 1 refers to the nature of the aural disease.

“ 2 gives the duration of the aural symptoms.

“ 3 The sign + that there was either a family history of tubercle or that there was a clinical evidence of such in the patient, independently of the ear.

- “ 6 B. T. refers to acid- and alcohol-fast bacilli, presumably-tubercular.
P. B. T. represents *Pseudo-bac. of tubercle*.
B. P. V. refers to *Bac. proteus vulgaris*.
N. B.—An exhaustive list of bacteria found is omitted.
- “ 7 records the organized cells present, in order of prevalence.

1	2	3	4	5	6	7	
Disease.	Dura- tion.	History of Pthiasis.	Age.	Sex.	Bacteria.	Cells.	Remarks.
1. C. S. M. E.	3	0	23	F.	Diplococci, staphylo- cocci	Pus, few squames.	
2. "	1 mo.	0	13	M.	Streptococci	Pus.	
3. "	3	0	25	M.	Staph.	Squames, pus.	
4. "	6	0	13	F.	Staph.	Squames	
5. "	21	0	21	M.	B. P. V., staph.	Squames, pus.	
6. "	2	0	16	M.	B. P. V.	Squames, pus.	
7. "	6	0	24	F.	None found.	Squames.	Cured.
8. "	14	0	17	F.	Dipl.	Squames, pus.	
9. "	31	+	36	F.	Staph.	Squames.	
10. "	3	+	14	F.	B. T.	Pus.	
11. "	4	+	23	F.	B. P. V. P. B. T.	Squames, pus.	
12. "	6	0	20	M.	Staph.	Squames.	
13. "	4	+	34	F.	Staph.	Pus. squames.	
14. "	4	+	17	F.	Staph. P. B. T.	Squames.	
15. "	5	+	24	F.	Staph. B. T. B. P. V.	Pus, squames.	Optic neuritis.
16. "	—	0	—	M.	Staph. B. T.	Squames, pus.	
17. "	15	+	38	F.	Staph.	Squames.	
18. "	—	0	—	F.	P. B. T.	Squames.	
19. "	15	+	18	M.	P. B. T.	Squames.	
20. "	9	0	38	M.	B. T.	Squames.	
21. "	3	+	—	—	P. B. T.	Pus.	
22. "	7	+	15	F.	B. T., dipl.	Pus, squames.	
23. "	4	+	19	F.	Dipl.	Pus.	
24. "	7	0	11	M.	staph., lepto- thrix.	Squames.	
25. "	4	0	17	F.	Dipl., stab.	Pus, squames.	
26. "	18	0	22	M.	Dipl.	Squames.	
27. "	20	0	34	M.	Staph., yeasts.	Squames.	
28. "	5	+	22	F.	B. T.	Pus.	Cerebral
29. "	4	—	19	M.	strept. bac.	Pus.	[abscess.
30. "	17	+	22	F.	Strept.	Pus.	
31. "	12	0	19	M.	Dipl., B. T.	Pus.	

32	C. S. M. E.	4	+	11	F.	B. P. V.	Pus.	
33	"	2	0	12	M.	P. B. T.	Pus.	
34	"	1	0	8	F.	Mic. tetrag.	Pus.	
35	"	16	+	21	F.	—	Pus.	
36	"	20	+(d)	24	F.	P. B. T.	Squames.	
37	"	12	+	17	F.	B. T.	Pus.	
38	"	?	0	14	M.	Strept.	Squames.	
39	"	4	0	4	M.	Staph.	Pus.	Cerebellar abscess.
40	"	mo.	+	21	F.	P. B. V.	Pus.	
41	"	11	+	21	F.	Staph., B. T.	Squames.	Gran. triturated, Stacke.
42	"	40	0	62	F.	B. P. V.	Squames.	
43	"	18	+	18	M.	Staph., dipl.	Pus.	
44	"	1	0	14	F.	Staph.	Squames.	Supp. glands.
45	C. S. M. R.	6	0	18	F.	Asperg. n.	Pus.	
46	"	17	0	24	F.	Staph., B. subtilis.	Squames.	The purulent discharge had ceased 2 years.
47	"	—	+	7	M.	Staph.	Pus.	Epithelioma.
48	"	6	0	21	F.	Mic. tetrag.	Squames.	Rad. mast. oper.
49	"	5	+	14	M.	Staph., dipl.	Pus.	
50	C. C. M. E.	8	+	27	M.	B. T.	Caseat.	Paracent. tymp.
51	C. S. M. E.	12	0	21	F.	B. subtilis.	Pus.	
52	A. S. M. E.	4 days.	+	10	F.	staph. Gonoc., strept.	Squames.	Mastoid abscess.
53	C. S. M. E.	6	0	9	M.	Staph.	Pus.	Supp. glands.
54	"	4	0	8	M.	Staph.	Pus.	
55	"	1	+	34	M.	B. T.	Squames.	
56	"	1	0	15	F.	Strept.	Pus.	Died general tuber.
57	"	16	0	20	F.	B. T.	Pus.	Supp. glands.
58	"	6	+	24	F.	Dipl., staph.	Squames.	
59	"	6	0	13	F.	Staph.	Pus.	
60	"	2	+	20	M.	B. P. V.	Squames.	
61	"	9	0	15	F.	Staph.	Pus.	
62	"	10	0	21	F.	Dipl.	Squames.	
63	"	4	0	19	M.	B. coli c.	Pus.	After two years' treatment.
64	"	20	+	33	M.	B. P. V.	Pus.	
65	"	12	0	37	M.	B. P. V.	Squames.	
66	"	10	+	13	M.	Strep. B. T.	Pus.	Right hemi-plegia, optic neuritis (double).
67	C. S. M. E.	6	+	16	F.	B. T. (twice).	Squames.	
68	"	26	+	31	F.	No B. T.	Pus.	
69	"	2 mo.	0	4	M.	B. T.	Squames.	
70	"	14	+	40	F.	P. B. T. (?)	Pus.	
71	"	—	0	4	M.	P. B. T.	Squames.	Extremely fetid.
72	"	7	+	33	M.	B. P. V.	Pus.	Pulmon. gangrene.
73	"	5	+	6	M.	Staph.	Squames.	Supp. glands.
74	"	10	+	21	F.	B. T.	Pus.	Cerebral abscess.
75	"	4	0	39	M.	Gonoc.	Pus.	Adenoids and supp. glands.

76	A. S. M. E.	6 d'ys.	+	1	M.	Gonoc.	Pus.	
77	C. S. M. E.	6 mo.	0	5	M.	Dipl.	Pus.	
78	"	15	0	36	M.	No B. T.	Squames.	Very fetid, Stacke; cholesteatom.
79	A. S. M. E.	3 wks	0	6	F.	Dipl bac., staph.	Pus.	
80	C. S. M. E.	25	0	27	F.	B. P. V.	Squames, pus.	Rad. mast. op.
81	"	11	+	37	M.	Staph.	Squames. pus.	
82	"	8	0	18	M.	Staph.	Squames. pus.	
83	"	13	+	14	M.	B. T.	Pus, squames.	
84	"	20	0	22	F.	B. P. V.	Pus. squames.	
85	"	6	0	12	M.	Staph.	Pus.	
86	"	5	0	9	M.	B. P. V.	Pus. squames.	
87	"	1½	0	11	F.	No B. T.	Pus.	Enlarged glands.
88	"	21	0	12	F.	Staph.	Squames.	
89	"	17	0	18	M.	Dipl., staph.	Squames, pus.	
90	"	3½	0	5	M.	Dipl., staph.	Pus.	Stacke; acute mast. abscess.
91	"	5	0	22	F.	Staph.	Pus.	
92	"	30	+	35	F.	Mic. tetrag.	Squames.	Very fetid.
93	"	18	0	20	F.	No B. T.	Pus, squames.	
94	"	5	0	10	M.	Staph.	Pus.	Supp. glands.
95	"	6	+	11	M.	B. P. V.	Pus.	
96	"	4 mo.	0	12	M.	Dipl., staph.	Pus.	Facial paraly- sis.
97	"	15	0	35	M.	No B. T.	Pus.	Very fetid.
98	"	20	0	27	M.	Staph., dipl.	Squames.	
99	"	6	0	7	F.	Staph.	Pus.	
00	"	2	+	27	M.	Mic. tetrag.	Pus.	