1922.

LEGISLATIVE ASSEMBLY.

NEW SOUTH WALES.

REPORT

OF THE

DIRECTOR-GENERAL OF PUBLIC HEALTH,

NEW SOUTH WALES,

FOR THE YEAR 1920,

Ordered by the Legislative Assembly to be printed, 26 *April,* 1922.

SYDNEY: JOHN SPENCE, ACTING GOVERNMENT PRINTER

1922.

DISEASES of the Urinary Tract—*continued.*

No.	Disease.	Specimen.	Organisms found.	Organism from which Vaccine as prepared.	Reporter.	Course, Dosage, &c.	Result.	Notes.
18/2488	Puerperal septicæmia.	Urine...	Pneumococci ...	Pneumococci ...	Dr. Shirlow ...	Course, about 2 weeks; 20, 50, 100, 200, 200 million at 3 day intervals.	Great improvement.	Other trouble supervened [illegible] treatment was discontinued; treatment—surgical, [illegible] abscesses after vaccine [illegible] No recurrence after 2 years; treatment failed.
17/7045 18/2491	Cystitis ...	,, ...	Coliform bacillus	Coliform bacillus	Dr. Waugh ...	Course, 6 injections; 60, 120 up to 180 million at intervals of 4 days.	Complete recovery.	
18/2665	Pyuria ...	,, ...	,, ...	,, ...	Dr. King ...	Course, 2 months; 60 million, increased by 60 million every 5 days.	Cured ...	Alkalis then acids.
18/2796	Pyelo nephritis with pregnancy.	,, ...	,, ...	,, ...	Dr. Blackall ...	Course, 5 weeks; 150 million, increased to 200 million.	,, ...	Formin, gr. v. + d.s.
18/3338	Cystitis ...	,, ...	,, ...	,, ...	Dr. Read ...	Course, 3 months, 30, 60, 120, 200, 250, 500 million, at intervals varying from 3–7 days.	Relieved ...	Hexamine and pot. cit., alk[illegible] and ac. sod. phos.; the [illegible] were relieved, but B.Co[illegible] did not completely clear [illegible] toms recur from time [illegible] patient had previous va[illegible] ment.
18/2372 18/4285	,, ...	,, ...	,, ...	,, ...	Dr. King ...	Course, 2 months; 60 million, increased by 60 million every 5 days.	Cured ...	Alkalis, then acids.
18/4319	Cystitis following blockage from enlarged prostate.	,, ...	,, ...	,, ...	,, ...	Course, 1 month, 60 million, increased by 60 million every 5 days.	,, ...	Urotropine.
18/4834	Bacilluria ...	,, ...	,, ...	,, ...	Dr. Blaxland	Course, 31 days; 60 million, gradually increased to 400 million at about 4 day intervals.	Probably cured	Patient discontinued treatm[illegible]
18/1425 18/2526 18/3740 18/4890	Cystitis ...	,, ...	,, ...	,, ...	Dr. King ...	Course, 6 months; 60 million, increased by 60 million every 5 days.	Cured ..	Alkalis, then acids.
18/3880 18/5135	,, ...	,, ...	,, ...	,, ...	,, ...	Course, 2 months; 60 million, increased by 60 million every 5 days.	,, ...	Bladder irrigation; urotropine.
18/4114 18/4722 18/5150	,, ...	,, ...	,, ...	,, ...	Dr. Reading ...	Course, about 6 weeks; 30 million, increased by 30 million every 3 days up to 250 million.	Considerable improvement as regards urine.	Patient consulted a special[illegible] found she had a tumor of th[illegible] and she did not return for [illegible] treatment.
18/3491 18/5938	Pyelitis ...	,, ...	,, ...	,, ...	Dr. Wherrett	Course, 1 month; 60 million, increasing by 30 million every 5–6 days.	Cured ...	Mixture pot. cit. c. Buchu; sy[illegible] cleared up; no pus or [illegible] present some days before [illegible] hospital.
18/5430	Pyonephrosis (left kidney removed); pyelitis (right kidney).	,, ...	,, ...	,, ...	,, ...	Initial dose 30 million, increasing by 30 million every 5 days; maximum dose, 250 million.	,, ...	No other treatment; blood [illegible] were present before nephr[illegible] albumin and pus afterwards [illegible] gradually cleared up.
18/5599	Cystitis ...	,, ...	,, ...	,, ...	Dr. Bowman	Course, 7 weeks; 250 million every 5th and 6th day.	,, ...	Pot. cit. gr. $\overline{xxx}$ d.s.
18/6272	Pyelitis ...	,, ...	,, ...	,, ...	Dr. Fetherston	Course, 5 months; no record of dosage.	Improved ...	At present in hospital with a [illegible] attack of pyelitis.
18/6345	Cystitis and pyelitis, following pyosalpinx.	,, ...	Coliform bacillus (Morgan type).	Coliform bacillus (Morgan type).	Dr. Marshall	Course, 5 weeks; 120 million, increasing by 30 million every 5 days.	Much improved.	Bladder irrigation; the vacci[illegible] be further continued at [illegible] home by another doctor.
18/6354	Pyuria ...	,, ...	Coliform bacillus	Coliform bacillus	Dr. King ...	Course, 12 months; 60 million, increased by 60 million every 6 days.	Cured ...	Alternate alkalis and urotro[illegible] acid; this was a very obstinat[illegible] and I am sure the vaccine eff[illegible] cure.
18/7017	,, ...	,, ...	Coliform bacillus and gram positive cocci.	Coliform bacillus and gram positive cocci.	,, ...	Course about 1 month; 60 million, increased by 60 million every 5 days.	,, ...	Alkalis.
18/7108	Bacilluria ...	,, ...	Coliform bacillus and gram positive diplococci.	Coliform bacillus and gram positive diplococci.	Dr. Ritchie ...	A few small doses	Improved (not sufficiently long treatment).	Patient was so much benefited [illegible] parents discontinued treatm[illegible]
19/881	Bacilluria and pyrexia.	,, ...	*S. Aureus* ...	*S. Aureus* ...	,, ...	12 cc. of vaccine, commencing with a small dose up to 500 million.	Cured ...	No attacks for a year.
19/1125	Cystitis ...	,, ...	*Bacillus proteus*	*Bacillus proteus*	Dr. Grant. ...	Course, 5 weeks; 250–500 million at 2, 3, or 4 days intervals.	,, ...	A similar attack 5 months prev[illegible] yielded to hexamine and ac[illegible] phos.; bladder irrigation pr[illegible] vaccine treatment; fairly [illegible] local reaction after injecti[illegible] vaccine.
19/1472	Bacilluria ...	,, ...	Gram negative, bacillus of Flexner type.	Gram negative, bacillus of Flexner type.	Dr. Menzies ...	Course, 3 weeks; 300 million every 4th day.	Improved ...	Urinary antiseptics.
19/1585	Pyelitis ...	,, ...	Coliform bacillus and gram positive cocci.	Coliform bacillus and gram positive cocci.	Dr. Macdonald	Two injections, 90 and 150 million.	,, ...	Urotropin synchronous with vac[illegible] patient improved, then return[illegible] her home in the country; no fu[illegible] records.
19/1610	Pyelitis; no clinical evidence save pyuria, following appendicectomy.	,, ...	Coliform bacillus and gram positive diplococci.	Coliform bacillus and gram positive diplococci.	Dr. Martin ...	Course, 2 months; 20 million, doubled every 7 days to 1,000 million, then 14 day intervals.	Cured ...	No other treatment.
18/7667 19/1862	Urinary fistulæ following accidental crushing of kidneys.	,, ...	Coliform bacillus	Coliform bacillus	Dr. Waugh ...	200 million every 7 days ...	Unaffected ...	Patient very debilitated; improv[illegible] commencement of treatment [illegible] relapsed afterwards.
19/2042	Pyonephrosis	,, ...	,, ...	,, ...	,, ...	Course, 4 weeks; 120 million every 4 days.	Improved ...	Disappearance of pain and frequen[illegible] increased weight; general impr[illegible] ment; no other treatment.
19/2368	Pyelitis ...	,, ...	,, ...	,, ...	Coast Hospital	Course, 3 months; 50 million, 75 million, &c., at intervals of 1 week.	Relieved ...	Other treatment, agathurin.
19/1497	Abscess of kidney.	,, ...	Coliform bacillus and *S. Aureus.*	Coliform bacillus and *S. Aureus.*	Dr. Waugh ...	120 million every 5 days ...	Improved ...	Patient previously drained by op[illegible] tion and gradually improved w[illegible] under treatment.
19/3414	Bacilluria and rheumatism.	,, ...	Coliform bacillus and gram positive cocci.	Coliform bacillus and gram positive cocci.	Dr. Mason ...	Course, 6 weeks; 40 million every 5 days.	,, ...	Salicylates and rest; the rheumat[illegible] followed 4 weeks after an abortio[illegible] fever and pains in elbow and wrist, [illegible] later pus formation; acute pain [illegible] both kidney regions; very little relief resulted till patient passed [illegible] small calculus per urethram.

DISEASES of the Urinary Tract—*continued.*

Disease.	Specimen.	Organisms found.	Organisms from which Vaccine was prepared.	Reporter.	Course, Dosage, &c.	Result.	Notes.
Cystitis during pregnancy.	Urine	Coliform bacillus	Coliform bacillus	Dr. Martin ...	Course, 6 weeks; 50 million, increased to 1,000 million at intervals of 7 days.	Improved ...	Citrates and hexamine, lavage of bladder after confinement; patient developed left sided pyelitis, for which the vaccine was repeated with no other treatment, and was cured.
Pyelitis or urinary calculus.	,, ...	Coliform bacillus and streptococci	Coliform bacillus (*B. Fæcalis Alkaligenes*).	, ...	Course, about 3 months; 100 million, increased by 30 million doses to 300 million then by 60 million doses to 500 million.	Cured ...	Citrates and hexamine given synchronously.
Pyelitis ...	,, ...	Coliform bacillus	Coliform bacillus	Dr. Loxton ...	Course, 3 months; 60 million, increased weekly by 30 million to 450 million.	,, ...	Alternating pot. cit. and hexamine before and synchronous with vaccine, all symptoms disappeared; patient in good health; other treatment alkalis.
Bacilluria ...	,, ...	,, ...	,, ...	Dr. Gordon ...	Course, 8 weeks; doses of 500–600 million at 4 day intervals. intervals.	,, ...	Most doses were followed by a moderate to severe reaction; a further catheter specimen of urine was sterile.
Influenza, followed by urinary symptoms.	,, ...	,, ...	,, ...	Dr. Trindall ...	Course, 15 days; 2 doses of 250 million at 4 day intervals; 3 doses of 500 million at 3 day intervals.	,, ...	In hospital 50 days; other treatment, diuretics and urotropin.
Cystitis ...	,, ...	Coliform bacillus and streptococci.	Coliform bacillus and streptococci.	Dr. King ...	Course, 5 months, 60 million, increased by 60 million every 5 days.	,, ...	Alkalis then acids; vaccine afterwards procured from a private source.
Pyelitis ...	,, ...	Coliform bacillus	Coliform bacillus	Dr. Muller ...	Course, about 8 weeks; 500 million increased to 1,000 million at 5 day intervals.	Unaffected ...	Hexamine, salol, and other urinary antiseptics.
Bacilluria ...	,, ...	Coliform bacillus and gram positive coccus.	Coliform bacillus and gram positive coccus.	Dr. King ...	Course, about 20 days; 120 million, increased by 60 million every 5 days.	Improved ...	Alkaline mixtures; patient left district before treatment was complete.
,, ...	,, ...	Coliform bacillus and streptococci.	Coliform bacillus and streptococci.	Dr. Ritchie ...	Course, 8 c.c. of 500 million per c.c.; dose up to 500 million.	Good so far ...	No other treatment.
Pyonephrosis, following pyelitis during pregnancy.	,, ...	Coliform bacillus	Coliform bacillus	Dr. Lee ...	Course, 4 months; 50 million, working up to 500 million every 7 days.	Much improved.	.....
Acute pyelitis	,, ...	,, ...	,, ...	,, ...	Course, 3 months; 50 million and upwards.	Cured ...	Appendix removed later; quite well 18 months later.
Acute than chronic cystitis of pregnancy.	,, ...	Coliform bacillus and gram positive diplococci.	Coliform bacillus and gram positive diplococci.	Dr. Parker ...	Course, 8 weeks; 150 to 450 million; latter dose maintained 6 day intervals.	Amelioration of symptoms.	Urinary antiseptic pyuria did not totally disappear till child was born.
Stubborn chronic pyelitis.	,, ...	Coliform bacillus	Coliform bacillus	,, ...	Course, 6 weeks; 150 to 450 million; latter dose maintained, intervals 6 days.	Complete disappearance pyuria.	Agathurin gr. vii t.d.s., which had apparently no action prior to vaccine.

5. ANTHRAX IN SHAVING BRUSHES.

(E. W. FERGUSON.)

1. INTRODUCTION.

The following report is based on the work done in this laboratory in connection with cases of anthrax which have been infected through the medium of infected shaving brushes.

To a great extent this report is the same as a paper submitted on the subject to the Australian Medical Congress, Brisbane Session, August, 1920; but the occurrence of additional cases since then has enabled me to add considerably to the information then available.

The conveyance of infection by shaving brushes has attracted considerable attention during recent years.

A most extensive account is given in a report to the Local Government Board by Dr. F. G. H. Coutts. This deals with a rather considerable number of cases (19) which occurred among the civilian population of Great Britain in 1915–16. In 11 of these cases anthrax bacilli were detected in the brush used by the patient, and in 4 other cases in brushes from the same source as the patient's brush. Of the 19 cases, 9 were infected from brushes made by the one manufacturer, who had employed mixed Chinese horse and goat hair.

During the same period 18 cases of anthrax occurred among troops in England, in 8 of which infection of shaving brushes was suspected, while in 9 the information was too meagre to allow of any opinion as to the source of infection.

Reports from the Army Medical Authorities show that 28 cases of anthrax occurred amongst troops in France from the beginning of 1915 and February, 1917. In 23 of these cases the site of the pustule was on or in close proximity to the shaving area. Brushes were tested in a number of instances, but with negative results, so that other sources of infection, such as contact with horses, blankets, &c., could not be excluded.

In 1917 a case of anthrax occurred in Western Australia in which infection was traced to a consignment of Japanese shaving brushes.

On receipt of information of this case samples of shaving brushes were obtained from various firms in Sydney and tested for the presence of anthrax bacilli. In all 28 brushes were tested, but with negative results. These experiments will be referred to later.

In the Annual Report of the Chief Medical Officer to the Minister of Health for 1920–21, an account is given of the occurrence of 21 cases of anthrax in England in which more or less suspicion fell on shaving brushes as the source of infection. In all but 6 of the cases anthrax germs were isolated either from the patient's brush or from one or more brushes of the same batch and pattern. Further references will be made to this report later.

Cases of Anthrax attributed to Shaving Brushes in New South Wales.

The present report deals primarily with cases that occurred in New South Wales from June, 1920, onwards. In the paper submitted to the Medical Congress, Brisbane, 3 cases were included which had occurred prior to that date and in which the source of infection was not proved.

The notes of these cases as far as available are now included here, in their chronological order, and not in the series of cases with which these investigations are particularly concerned.

(*a*) Among the laboratory papers dealing with anthrax are records of two shaving brushes which were forwarded from the Sydney Hospital for the purpose of testing for anthrax bacilli. Guinea-pig inoculations proved negative in both cases. On inquiry at the hospital the Medical Superintendent informed me that there had been a case of anthrax at Sydney Hospital in May, 1919 (the date of examination of the brushes), in which the pustule was situated on the shaving area. The possibility of the shaving brush infection in this case therefore cannot be excluded.

(*b*) In October, 1919, information was received from a medical officer at Tamworth that a patient in the public hospital there had contracted anthrax, the pustule being on the face. The doctor stated that examination of fluid from the vesicles showed typical anthrax bacilli. The patient volunteered the statement that he cut his face while shaving, and on inquiry he stated further that he had been given the new shaving brush two or three days previously. The brush was forwarded to this laboratory for examination. Cultures showed no colonies at all suggestive of anthrax. A guinea-pig was inoculated with ½ c.c. of suspension from the brush and died after six days. A post-mortem showed some bloody œdema around the puncture and some general congestion of the organs, but the spleen was not enlarged, and smears from the heart's blood, liver, and spleen showed the presence of coliform organisms. In view of this finding the death of the animal was attributed to other causes than anthrax, but it does not appear that any smears or cultures were made from the inoculation point, and it seems probably now that the animal may have really died from a localised form of anthrax, particularly in view of the œdema around the inoculation point.

(*c*) I am informed by Dr. Millard that some months ago there was another case of anthrax admitted to the Coast Hospital in which the lesion was situated on the shaving area, but at the time no suspicion was raised as to it having been conveyed by a shaving brush, and the patient's brush was not examined.

In addition to the cases from New South Wales, 2 cases of anthrax due to shaving brush infection have occurred recently in Victoria. One of these is included in the present series as the brush was purchased in New South Wales. The other is not included, and we have no knowledge of the type of brush implicated.

Recent Investigations.

Methods of Examination.

Method of Examination.—The brushes to be tested were steeped in about 30 c.c. of peptone water, and after a thorough soaking as much as possible of the peptone water was squeezed out against the sides and bottom of a petri dish.

Cultures.—Cultures were made from this suspension, which was generally fairly turbid, by spreading a platinum loopful over the surface of an agar plate. This was incubated for twenty-four hours and examined under the microscope for the fluffy colonies of the *Bacillus anthracis*. Owing to the presence of other sporers the anthrax bacilli were often obscured and could not be detected in cases where subsequent animal inoculations showed that the brush was infected. No reliance could, therefore, be placed on cultural methods, and our conclusions as to whether a brush was infected or not were based entirely on the animal inoculations. As a control of these latter, however, they were sometimes of use; in one instance, for example, where five out of six brushes proved fatal to guinea-pigs, cultural methods showed the presence of anthrax bacilli in three out of the five.

Animal Inoculations.—½ c.c. of the suspension in the peptone water was injected into the groin of a guinea-pig. Infected animals died in from three to four days; non-infected were kept in the cage for seven days, and where there was no reason to believe the brush was infected they were discharged into the stock cages, but not again utilised for anthrax experiments. In the experiments on disinfection, animals that showed no evidence of disease were killed and examined at the end of seven days. Owing to shortage of cages it was sometimes necessary to keep two experimental animals in the one cage. In several instances both animals died, but there was no evidence of one having infected the other, as in each case the death took place almost simultaneously, and post-mortem showed in every instance that infection had spread from the inoculation point. Furthermore, in several instances, where two animals had been kept in the one cage and one had died of anthrax, the remaining animal remained healthy though under observation for as long a period as two to three weeks. In making the inoculations the same syringe was used throughout the experiments; it was sterilised by careful washing in hot strong carbolic solution, and there is no evidence that infection was conveyed from one animal to another through the medium of the syringe.

In the report of the Minister of Health, 1920, p. 265–6, a somewhat different procedure is given. For unused brushes it was deemed sufficient to investigate the collected washings from the brush after centrifuging.

In the examination of the original brush the base of the hairs where embedded in the mount was always dissected out and ground up in a mortar before investigation. We have employed this method with success where the washings from the free bristles proved negative.

In our work we have relied solely upon the animal inoculations, the cultural work being early abandoned owing to the way in which the anthrax bacilli were overgrown by other sporing bacilli. The methods adopted by Dr. Eastwood might, however, have been employed with advantage. This was to prepare deep plates of a series of dilutions of the washings by placing a quantity of each dilution in a petri dish, pouring on liquified agar and gently agitating to distribute the inoculum. Suspicious colonies were picked out and confirmed by animal inoculation.

In the event of no suspicious colonies being found portion of the original emulsion was utilised for animal inoculation.

History of Cases.

Case 1.—The present investigations are the outcome of a case of anthrax that was admitted to the Coast Hospital in June, 1920. There was a history of the patient having recently purchased a new shaving brush which he had only used three times. The pustule was situated on the neck just below the chin. Cultures and smears from the pustule made at the hospital showed the presence of anthrax bacilli. The shaving brush was submitted to this laboratory for examination for the presence of anthrax. A suspension was made by steeping the brush in about 30 c.c. of peptone water and a loopful was plated on agar. No anthrax bacilli were detected; ½ c.c. of the suspension was injected into a guinea-pig, which died in three days with typical post-mortem lesions of anthrax, and smears and cultures from the inoculation point, heart's blood and spleen showed the presence of anthrax bacilli.

The shaving brush was of a poor kind, with a brown wooden handle, and the bristles dirty and many loose. No brand or identification mark was present. This brush had been purchased from a chemist's shop in one of the suburbs of Sydney, and on receipt of this information a visit was paid to the shop by one of the Pure Food Inspectors, and the balance of the brushes seized. Nine brushes of this type were submitted for further examination to this laboratory, and in 6 cases inoculations into guinea-pigs showed that the brushes were infected with anthrax.

Case 2.—In July, 1920, information was received from Glen Innes that a case of anthrax had occurred in a patient in the hospital there. The lesion was described as a virulent septic condition of the chin like anthrax, and there was a history of the patient having just used a new shaving brush, which was forwarded to the laboratory for examination. Cultures were made from a suspension of the brush, but were overgrown with a proteus bacillus. Portion of the suspension was also inoculated into a guinea-pig, which died on the fourth day from anthrax, typical bacilli being isolated in smears and cultures from heart's blood, spleen, and inoculation point.

The Medical Officer at Glen Innes was communicated with in order to obtain smears or cultures from the patient, but the pustule had already been excised and the wound was granulating, and cultures showed merely *Staphylococcus aurous*. The proof of this being a case of anthrax therefore rests entirely on the clinical appearances and on the fact of the shaving brush being infected.

This brush was also a brown wooden-handled one of similar quality to those in Case 1, but somewhat different in shape and in colour. The local Government Medical Officer reported that he had visited the shop from which the brush was purchased and seized other brushes in the shop with a view to having them also tested. Animal inoculations showed that two brushes of the same pattern as the original brush, but differing in colour, were infected.

Information was obtained from the retailer that his shaving brushes had been purchased from two importers in Sydney. Both of these were visited, but no brushes corresponding in type to the original brush were secured.

Case 3.—A patient was admitted to the Coast Hospital at the end of July, 1920, with a malignant pustule at the right angle of the lower jaw. He had been admitted at first into the Royal Prince Alfred Hospital and anthrax bacilli were found there in smears from the pustule. At the Coast Hospital the pustule was excised on admission and no cultures were made. The patient stated he had purchased a new shaving brush ten days previously and had used it once only, six days before admission to hospital. The brush was submitted for examination, but cultures were negative, and a guinea-pig inoculated with a suspension showed no evidence of the disease and was killed after seven days; post-mortem examination revealed no evidence of anthrax. Further investigations were conducted into the possibility of anthrax spores being present in the roots of the hairs, but the inoculated animal showed no evidence of infection.

The brush was of a more expensive type than in other cases, the handle being made of white composition (xylonite), with a black band around the base of the hairs with the words "Held in Rubber" printed on it.

Inquiry showed that these brushes were of American manufacture and were imported in shaving sets, there being a brush and a mug to each set. Six other brushes of this type were procured from the retailer and from the importer, and were of varying design, none of the brushes being of absolutely identical pattern with the original brush of Case 3. Further inoculations were carried out with these brushes, but with negative results, and it is possible that the case in question was infected from some other source than the shaving brush, the only suspicions that the shaving brush was implicated is the fact that the lesion was on the shaving area.

Case 4.—A pustule excised from neck was forwarded from Orange in methylated spirits. Sections showed the presence of large gram positive bacilli suggestive of anthrax.

The brush used by the patient was subsequently forwarded for examination. It was stated that the brush had been used several times by the patient before developing anthrax. Inoculation into a guinea-pig of washings from the brush proved negative. The roots of the hairs were, however, not tested.

Case 5.—A patient was admitted to Sydney Hospital on 8th September, 1920, with a malignant pustule on the left side of the face and glandular involvement. The patient, an ironmonger, gave a history of having cut his face on 4th September, 1920. Bacteriological examination of the pustule made at the hospital showed the presence of gram positive bacilli, arranged end to end in pairs, some in chains. No spores were seen, nor other organisms. Very few pus cells were present. The patient's shaving brush was forwarded to this laboratory for examination. Cultures and animal inoculation with washings from the brush proved negative for anthrax.

The brush was a plain wooden-handled one bound round with string. The retailer—a barber—was visited and 40 brushes of the same type were seized. Three out of the 40 were tested by animal inoculation, and in one case the guinea-pig died in three days from anthrax.

It was stated that these brushes had been in the country for four years, but no information could be obtained as to their importation.

The type of brush implicated is of interest as reference is made in the report of the Minister of Health, 1919–20 (*vide supra*) to a wooden-handled, string-bound brush which was traced back to August, 1917, and presumably belonged to a brand implicated in the 1916–17 outbreak in England.

Furthermore, in his report, Dr. Coutts mentions that brushes of a certain type, manufactured in England from infected hair, had been exported to various places and among others to Sydney. As no description is given of this type it is impossible to say if this particular brush belongs to this consignment.

Case 6.—A fatal case of anthrax occurred at Wodonga (Victoria) during August. The history of the case is briefly as follows:—

The patient, a single man, aged 24 years, attended the Wagga Show on 24th August, and on his way through Albury purchased a shaving brush and razor, which, however, he did not use till his return on the 29th. The illness commenced on 30th August, the lesion being described as a cutaneous eruption on the left cheek, which was accompanied by swelling of the side of the neck. Death took place on 1st September. Apparently anthrax was not a first suspected, but a few days later the father of the patient drew attention to the fact that a new shaving brush had been used. The shaving brush was then procured by the doctor and forwarded to Melbourne, and cultures and animal inoculation showed the brush to be infected.

In order to trace the brush an inspector was sent to Wodonga and Albury from this Department. Absolute information could not be obtained as to where the brush was purchased, but the available evidence pointed to a tobacconist in Albury, who first admitted selling a brush and razor about that time, but later stated he had sold them to a person he could identify a fortnight previously.

The brush was described as a wooden-handled brush with the bristles bound with string. Brushes of this description were obtained from the tobacconist and identified by the family as resembling the original brush. These were submitted to this laboratory, but animal inoculation failed to show the presence of anthrax bacilli (G. 9283–4).

Other samples of cheap brushes were purchased at various shops in Albury (G. 9285–6, G. 9655–60), and among them wooden-handled brushes bound with string of the same type as that implicated in Case 5. The washings from one of these when injected into a guinea-pig caused death in three days from anthrax. It was stated that this brush had been in stock for five years. It is impossible to determine whether this brush was of the same type as the brush used by the patient.

Case 7.—During December a specimen of a malignant pustule was received from the Granville District Hospital. As the site of the lesion was stated to be on the neck, inquiries were instituted and information obtained that the pustule was situated on the midline of the neck and was clinically anthrax.

The following history was subsequently obtained from the wife of the patient:—

A shaving brush was purchased by Mrs. W. from a hairdresser at Bankstown on 29th November. This was not immediately used, as the patient (W.) objected to it on the score that it was of Japanese manufacture and also that hairs were coming out. Subsequently the brush was used after a preliminary soaking in carbolic. On 17th December the patient while shaving and using the new brush cut a small pustule on his neck. He went to work next day, but returned feeling out of sorts. Next day the neck was decidedly sore, and became very swollen on the 20th. He consulted a doctor on that date, and was admitted to hospital; subsequently he was removed to the Coast Hospital and eventually recovered. The specimen originally sent to the laboratory was in formalin, and cultures could not be made. Sections showed an intense inflammatory condition, but anthrax bacilli were not demonstrated.

The brush was obtained on 24th December. It proved to be a white bone-handled one, with imitation badger brush. A guinea-pig was inoculated with washings from the brush, but remained healthy. A second guinea-pig was inoculated with washings of hairs pulled out from the root, but did not develop the disease.

On 30th December a brush of the same type was purchased from the same shop in Bankstown. Washings were made by steeping the brush in peptone water and ·5 c.c. inoculated into a guinea-pig. The animal died in four days with typical anthrax, the bacilli being recovered in culture from heart, spleen, and inoculation point.

Case 8.—A case of anthrax occurred at Junee during December. The patient, R.C., gave a history of having cut himself while shaving, a "spot" or "pimple" subsequently forming at the cut. He saw a doctor on 21st December, and became progressively worse, though with very little constitutional disturbance. On the 27th he was sent to Wagga for bacteriological examination, which was pronounced positive. The pustule which was situated on the under side of the right lower jaw was excised on 28th December.

The brush was secured and sent down to this laboratory. There is no evidence as to how long the brush had been in use, though it is stated that the occasion on the which the patient cut himself was not the first time the brush had been used.

The brush had been purchased from a local chemist, and the remaining three brushes of the same batch were secured and forwarded to the laboratory. These had been purchased two years previously from a firm in Sydney.

The patient's brush and one of the others were white-handled brushes with two rings round the handle; the remaining two were wooden-handled with white tops. These brushes were tested by guinea-pig inoculation, but gave negative results.

The patient's brush was then broken up, the root of the hairs extracted and ground up in a mortar. Portion of the resulting emulsion was injected into a guinea-pig, which died of anthrax in three days.

Case 9.—Smears were received on 9th March, 1921, from a pustule on the face of a patient in Carcoar Hospital, diagnosed clinically as anthrax. Examination showed the presence of large partially gram positive but much degenerated bacilli which might have been anthrax bacilli.

A report was sent to this effect, and further specimens asked for. The excised pustule and two slope cultures were then received. The cultures were overgrown by other sporing bacilli, and anthrax bacilli could not be isolated.

A guinea-pig was inoculated with the serum expressed from the pustule, but did not develop anthrax.

Sections of the pustule showed a highly necrotic tissue among which were some suspicious-looking bacilli.

No clinical details are available, but the statement was made that the infection had been probably conveyed by a shaving brush. The shaving brush was received from the wife of the patient, and proved to

be a white bone-handled imitation badger hair brush, with two rings round the handle. Washings from the brush were inoculated into a guinea-pig which, however, remained healthy. The cement containing the roots of the hairs was then removed, broken up and a suspension made in peptone water; ·5 c.c. of this was injected into a guinea-pig, which died in four days with lesions of anthrax from which anthrax bacilli were recovered.

Three other brushes were obtained from the retailer in Sydney, each being taken from a separate box; a guinea-pig was inoculated with the washings from each, and in each case died from anthrax.

Case 10.—A fatal case of anthrax occurred in Liverpool State Hospital in April. No clinical particulars are available, beyond the fact that the pustule was on the shaving area. The patient had been residing at Canley Vale when infection took place. Smears from the pustules were examined at this laboratory, and were full of morphologically typical anthrax bacilli. One of the unstained slides was washed off and the washings injected into a guinea-pig on 7th April, 1921. Subsequently (8th April, 1921) portion of the pustule was obtained after the death of the patient, and fluid from this was injected into the same guinea-pig, which died on 11th April, 1921, with lesions of anthrax from which the bacilli were recovered.

At our request the patient's brush was forwarded. This was a black-handled wooden brush, apparently new, and recalling the infected brushes obtained from Glen Innes, none of these were, however, available for actual comparison.

It was stated that the brush had been bought at a shop in George-street, Sydney, but the name of the vendor was unknown, and so far the brush has not been traced.

Washings from the hairs were injected into a guinea-pig which, however, did not develop anthrax.

The mount was then removed and the base of the hairs dissected out and emulsified in peptone solution, ·½ c.c. of which was injected into a guinea-pig, which died in three days from anthrax.

Case 11.—M.G., aged 19 years, was admitted to the Coast Hospital on 2nd April, 1921, with an anthrax pustule on the right cheek. Smears made at the hospital showed the presence of anthrax bacilli; the lesion was excised and the section showed extensive necrosis of the tissues in which baccilli resembling *B. anthracis* were detected.

The patient, a school-teacher, stated that he bought a shaving brush in Queanbeyan on 5th February, as he shaved not more than once a week, and sometimes less often, the brush had been used by him only about six times. He last used in on 23rd March, 1921, and the first signs of the pustule appeared on 29th March, 1921.

The brush, which was forwarded to the laboratory, was a white-handled one, identical in design with the brush implicated in the Carcoar case (Case 9). The base of the hairs was dissected out, and an emulsion therefrom injected into a guinea-pig, which died in four days from anthrax.

Case 12.—E.L.M. died at St. Peters on 13th June, 1921, from anthrax, the pustule being situated on the left side of the face. There was a history of the patient having purchased a new shaving brush at Condobolin. The pustule appeared on the 7th June, and on the 11th the patient left Condobolin for Sydney. He was seen by a medical practitioner on the 12th, and then the pustule did not appear typical; there was no vesiculation, and the patient's condition was not serious. On the night of the 12th severe symptoms set in, cerebral in type, and the patient was comatose when seen next morning. I examined the pustule on the morning of the 13th instant and took smears and cultures in which anthrax bacilli were detected. The patient died that afternoon.

The brush was a brown varnished handled brush of the same make as that implicated in Case 1.

The base was dissected out and washing injected into a guinea-pig which, however, did not develop anthrax. No information could be obtained as to the name of the vendor. Inquiries are, however, still being made in this direction.

Inquiries were made at Condobolin as to the existence of similar brushes on the market there, but none could be discovered.

Case 13.—G.M. was admitted to Sydney Hospital on 13th June, with a malignant pustule on the chin. The patient gave a history of having cut himself while shaving on the 11th instant, clinically the pustule was typical of anthrax, and anthrax bacilli were demonstrated at the hospital.

The patient stated that he had left his usual brush in Melbourne, and had purchased a cheap brush (A) in Sydney, but not liking the appearance of it had obtained a more expensive one (B) from a shop at Manly. It was this second brush which the patient was using when he cut his face. Both brushes were sent to the laboratory for testing.

Brush (A) was a wooden handled brown varnished brush of different shape to the brush implicated in Cases 1 and 12, but of the same type as a brush (7,801) previously tested and not found infected.

The guinea-pig inoculated with washings from the base developed anthrax and died in three days. The balance of the stock of this type was obtained from the retailer, but investigations so far have failed to detect any infected brushes. Similar brushes were obtained from other vendors and were said to have been of British manufacture; two of these have recently proved infected.

Brush (B) was a white bone-handled brush with two rings of somewhat different shape to any brush hitherto tested.

A guinea-pig was inoculated with washings from the root, but did not develop anthrax.

Two further brushes of the same type were obtained from the vendor and guinea-pigs inoculated with washings from the bristles; one of the guinea-pigs died in three days from anthrax.

Case 14.—A fatal case of anthrax occurred at Ashfield during June, 1921. The patient (W.H.) developed a pustule on the right side of the neck under the jaw on 21st June, 1921. He was not seen by a medical man until 25th June, 1921, and then there was a black central eschar surrounded by a ring of small vesicles, the whole being surrounded by œdema. A swabbing from the pustule was forwarded to this laboratory on 28th June, and anthrax bacilli were grown from it, the finding being confirmed by animal inoculation. The pustule was excised on 29th June, 1921.

The patient's shaving brush was also forwarded for examination. It was a bone-handled brush not resembling any hitherto tested. It was stated to have been in use for six months previously. Guinea-pig inoculation from the base of the hairs proved negative.

In view of the length of time the brush had been in use, and of the negative result obtained from the base, it was thought that infection may possibly have been derived from some other source.

TABLE I.

ANTHRAX BACILLI DEMONSTRATED.

Case.	Location of Cases.	Lesion.	Patient's Brush.	Other Brushes of same type.	Remarks.
1	Coast Hospital (Sydney).	+	+	+	
2	Glen Innes	Not investigated...	+	+	Two other brushes of same shape, but different colour, proved infected.
3	Coast Hospital (Sydney).	+	—	—	
4	Orange	+ sections only ...	—	.....	
5	Sydney Hospital ...	+	—	+	
6 (Fatal).	Wodonga (Albury)	Not investigated ...	+	+	Original brush investigated in Melbourne. One infected brush found at Albury, doubtfully of same type as patient's brush. Infected brush same type as in Case V.
7	Granville Hospital (Bankstown).	Sections only. No bacteriological examination.	—	+	Brush purchased at Bankstown.
8	Junee	+	+	—	
9	Carcoar (Sydney) ..	+	+	+	Brush purchased in Sydney.
10 (Fatal).	Liverpool	+	+	.....	Brush of similar type to infected brush of Case II.
11	Coast Hospital (Queanbeyan).	+	+	.....	Brush of same type as in Case 9.
12.	St. Peters (Condobolin).	+	—	.....	Brush of same type as in Case 1.
13	Sydney Hospital (Sydney).	+	A. +	—	A. Purchased, but not used.
			B. —	+	B. Used.
14	Ashfield.....	+	—	.....	Brush, six months in use.

Summary.

Anthrax lesion on shaving area.....	14 cases.
Anthrax bacilli detected in patient's brush	7 cases.
Anthrax bacilli detected in similar brushes though not in patient's brush	3 cases.
Anthrax bacilli not detected in brushes examined	4 cases.

Thirteen of the cases occurred in New South Wales in other the case the brush was purchased in New South Wales.

Investigations into the Presence of Infected Shaving Brushes on the Market.

In view of the results obtained in connection with Case 1 it was decided to examine other brushes on sale in Sydney with a view to determining whether other brands of Japanese manufacture were also infected. An investigation of this nature had previously been undertaken in 1917 at the time of the occurrence of a case of anthrax in Western Australia, where infection was traced to a shaving brush of Japanese manufacture. At this time 28 brushes from five firms were examined, but anthrax bacilli were not detected. It is possible, however, that infected brushes may have been missed, as in 19 cases cultural methods alone were relied upon for the detection of the anthrax bacilli, animal inoculations not being carried out. The present series of experiments has shown that cultures made from shaving brushes are often heavily contaminated by other sporing bacilli of the *subtilis* and *mesentericus* groups, which obscure the presence of anthrax bacilli. In such cases animal inoculations will often show a brush to be infected.

In January, 1920, the Commonwealth Government prohibited the importation into Australia of brushes of any description from Eastern or South Eastern Asia, India, Ceylon, Japan, or the East Indian Islands, unless accompanied by a certificate from a responsible official from the Health Department of the country of origin certifying that they had been effectively disinfected. It was known, however, that many of the brushes on the market had been imported twelve months or more previously, and just before the regulation came into force.

On receipt of information as to the place of purchase of the brush implicated in Case 1, the Chief Inspector, Pure Foods Branch, visited the shop and obtained all the remaining brushes of the consignment. He also visited the importer and obtained information that the brushes in question had been imported twelve months previously. From here he was enabled to trace the distribution of this consignment to nine retail shops and obtained the remaining stocks from each place. In all 207 brushes were obtained from various places in the city and suburbs. Nine of these brushes from the same shop as the original brush were sent to the laboratory to be tested. In 6 cases the animal inoculated with the suspension from a brush died within four days; in 5 of these the *post-mortem* showed typical lesions of anthrax, and anthrax bacilli were recovered in smears and cultures from the inoculation point, spleen, and heart's blood. In one case the *post-mortem* appearances were typical, bloody œdema spreading from the inoculation point, tarry blood, and enlargement of the spleen; but anthrax bacilli could not be demonstrated either in smears or cultures from the inoculation point, heart's blood, or spleen. The animal in question died in two days, and it is probable that, notwithstanding the failure to demonstrate the anthrax bacilli, death was in reality due to anthrax.

Subsequently samples were tested from the brushes obtained from each shop. In one instance 1 infected brush was found out of 6 examined, in the other 8 cases a single brush only was examined, but in each instance the inoculated guinea-pig died from anthrax.

The

The brushes in question were of a very poor quality with rough wooden brown handles and imitation badger brush. The hairs were mixed and appeared to be principally goat, with horse and other animal hair; many of the hairs were loose and the brushes as a whole were very dirty.

A brush of another type (G. 6271a), but imported at the same time, was purchased at the same shop as the first lot of brushes. This was a white composition handled imitation badger brush of somewhat better appearance. A guinea-pig was inoculated with a suspension from the brush and died in three days, anthrax bacilli being recovered from the spleen, heart's blood, and inoculation point. The remaining 8 brushes of this type were also obtained. As the brush was received in the same parcel with the 9 brushes of the other brand referred to and might possibly have been infected in transit, 2 of the 8 further brushes of this type were investigated, and 1 was proved to be infected.

Sample brushes were then obtained from three different firms and tested for the purpose of anthrax by animal inoculation.

G. 6675.—A metal-handled brush from another source was tested and found to be infected. A guinea-pig died in three days with generalised anthrax. The rest of the consignment (42) were then obtained and were the subject of further experiments.

Two of the brushes (G. 7883–4) were taken from separate boxes, and the washings injected into guinea-pigs, no infection occurred. Later on two further brushes (I. 4157-8) were tested, in one case the washings from the embedded portion of the hairs were injected. No evidence of anthrax was obtained, but 1 guinea-pig died after eleven days from a disease then affecting the experimental guinea-pigs. The evidence of this make of brush being infected rests on the result obtained with the first brush, this was taken from the shop window, and the possibility of its having accidentally become contaminated from other brushes cannot, therefore, be excluded.

The brushes are of Japanese manufacture and bear no mark of identification, but are packed in cardboard boxes in lots of half a dozen, the boxes bearing on the cover a picture label with an elephant and the words "trade mark" and "Made in Japan." It was stated that these brushes were imported twelve months ago, but with a certificate of disinfection. So far, however, copy of this certificate has not been seen.

G. 7330–4, G. 7545–6.—An odd lot of 7 brushes of different designs were purchased from a pharmacist and tested by animal inoculation. One of the animals inoculated died in twenty-four hours. The *post-mortem* showed no lesions suggestive of anthrax. There was some intestinal congestion and the animal probably died from a muco-enteritis. Cultures from the spleen, heart's blood, and inoculation point were sterile. The remaining animals remained healthy and were discharged after a week.

G. 7543–4.—Two sample brushes of different design were purchased from another retailer and suspensions were injected into guinea-pigs. In both cases the guiea-pigs remained healthy.

G. 7669–70.—Two boxes of shaving brushes of a different brand were purchased from the same retailer as the lot G. 6675, which had been found previously to be infected. Each box contained 6 brushes, 2 were selected at random and inoculations made into guinea-pigs; both animals remained healthy.

G. 7801, G. 7804.—Two out of 5 wooden-handled brown varnished brushes that were obtained from the same vendor in Glen Innes as the brush implicated in Case 11, proved not to be infected. These brushes are of interest as subsequently (see Case XIII) an infected brush of similar type was discovered.

In connection with the investigations into the case of anthrax at Wodonga (Case VI) a number of brushes were tested from various retailers in Albury.

G. 9383–4.—Two wooden-handled brushes, bound with string around the top of the handle where the bristles were embedded, were purchased from the retailer who was believed to have sold the brush to the patient. These brushes were also recognised as being similar to the patient's brush. Guinea-pig inoculations with washings from both brushes proved negative.

G. 9385–6.—Two brushes, somewhat similar to the last, but differing in the distance to which the string extended along the handle, were purchased from another shop. These brushes were identical with those implicated in Case V. One of the brushes was proved infected by animal inoculation.

G. 9641–4, G. 9655–9660.—Ten other brushes from five retailers were also tested. These brushes varied in make and design—all proved non-infected on animal inoculation.

G. 9645.—A sample brush from the Stores Supply Department was tested, but proved negative.

Certificated Brushes.—In view of the Commonwealth prohibition of importation of brushes from the East, unless accompanied by a certificate of disinfection, a box of 6 brushes were purchased from the importer who had supplied the first infected lot. These were accompanied by a certificate of disinfection. This certificate stated that the "undersigned certifies that the hair of the brush which was described within the list attached was effectively cleansed and disinfected for manufacture," and was signed by the Chief of the Sanitary Department, Offices for Disinfectant Affairs and Export of the Osaka Prefectural Government, Osaka, Japan, and bore the seal of the Osaka Prefectural Government. The brushes were imported in May, 1920. It will be observed that no description is given in the certificate of the brushes to which it refers, probably the list attached was the invoice of the brushes imported.

Suspensions were made from the 6 brushes and a ½ c.c. was injected in each case into a guinea-pig; 5 out of the 6 guinea-pigs died within a period of trom two to four days with typical *post-mortem* lesions of anthrax, and anthrax bacilli were recovered in smears and cultures from the inoculation point, heart's blood, and spleen.

To confirm these results a further box of the same brushes was purchased from the importer and 2 selected at random from the 6 contained in the box, and suspensions of these injected into guinea-pigs. One of the guiea-pigs died in four days from anthrax, the remaining guinea-pig remained healthy and was killed after a fortnight, but showed no evidence of anthrax.

Information of the results of these investigations were forwarded to the Commonwealth Authorities who made full inquiry into the origin of the brushes.

Subsequently a letter was received from the Prime Minister's office stating that the certificates forwarded were not the correct ones relating to the infected brushes, and that the correct certificates showed that they were dated December, 1919, before the arrangements contained in the then existing proclamation became effective.

The importation of shaving brushes from Japan and Eastern countries was prohibited by Commonwealth Proclamation from 31st December, 1920.

This, however, does not minimise the risk of infections contracted from brushes imported before this date, and is shown by the occurrence of Cases IX, X, and XI.

Origin of Infection and Conditions of Manufacture.

No information is available as to the origin of the infected hairs from which the shaving brushes in question have been manufactured. It is well known that animal hair from Eastern countries is liable to be heavily infected with anthrax. This in particular applies to horse hair, but goat hair is also known to be liable to infection. In the report of the Departmental Committee appointed to inquire as to precautions preventing danger of infection by anthrax in the manipulation of wool, goat hair, and camel hair, London, 1918, the following brief summary is given of the information gathered as to the degree of infection of the abovementioned articles.

Practically all wool, hair, and animal products appear to be or are liable to be infected with anthrax spores more or less frequently; but the materials most frequently found to be infected are in the approximate order of severity of infection:—

1. East India goat hair.
2. East India wool.
3. Persian wool.
4. Mohair and other goat hair including Cashmere.
5. Egyptian wool.
6. Alpaca.

Dr. Crouch in his report shows that the material used for making the shaving brushes, which were found in England to be infected, was what is known in the trade as Chinese hair. This consisted practically of mixed goat and horse hair, and before the war was in great part re-exported from London to Belgium, Germany, France, and America; English manufacturers avoiding the use of this material, either because it was known to be infected with anthrax or to avoid difficulties in connection with the Home Office regulations. During the war, however, this hair was utilised in the manufacture of brushes. Evidence from the large dealers in hair was that the cheap Chinese hair came in short lengths and was apt to be dirty and to contain mixed hair of various animals, sometimes even including horse hair. A low quality " was known as Chinese combings consisting of the refuse off the floors of the premises where the hair is sorted into lengths. It is usually very dirty material and recognised by the trade as being exceedingly liable to be infected with anthrax. The Chinese hair is imported in cases or bales in which are closely packed a number of bundles or drafts. These drafts consist of a large number of hairs of approximately the same length tied up in bundles which may vary in thickness. The hair bundles are of different lengths, the longer hair being the more valuable. Some bundles may contain hairs only 2½ to 3 inches long, and it is such short hair that it is used for the making of shaving brushes."

It seems probable that in, at any rate, some of the brushes found infected in Sydney hair of this class was utilised for manufacture. There is no information available as to whether the hair is imported into Japan or obtained from local animals, with the exception that in a letter from the Japanese Consulate allusion is made to regulations including inspection of hair at first port of delivery. A number of the shaving brushes have been examined and found to consist of more or less mixed hair, mainly goat, but including horse and other animal hair which has not yet been positively identified.

In the Annual Report of the Chief Medical Officer, Ministry of Health, 1919-20, p. 268, is given an extract from a report from Japan on the conditions of manufacture of shaving brushes in that country. This extract is here quoted *in extenso*:—

Conditions of Manufacture in Japan.

The following extract from a report received from Japan illustrates the methods employed in the manufacture of these brushes:—

As the manufacture of shaving brushes is entirely a domestic industry there are no proper arrangements for disinfecting the bristles at the places where they are made into brushes. The Department of Agriculture and Commerce has charged the Prefectural Authorities with the duties of disinfection, which are carried out by the Sanitary Departments in the various prefectures, except in Osaka, Tokyo, and Hiroshima, where brushmakers' guilds (*dogyo kumiai*) exist. In these three places the work of disinfection has been delegated to the guilds.

Generally speaking the system hitherto in force has been that disinfection is not compulsory for brushes intended for sale in Japan. For brushes intended for export disinfection of the bristles before any other work is done upon them is compulsory. In the case of brushes made in Osaka, for export to Australia only, samples of the finished goods are subjected to a bacteriological test, and upon the basis of this test certificates are issued by the Sanitary Department, without which the Commonwealth Customs authorities will not admit the brushes into Australia. The Sanitary Department issues no certificate on the basis of the disinfection carried out by the guilds. This bacteriological test is optional as regards brushes for destinations other than Australia, but in certain cases goods for other countries are subjected to it.

Disinfection of Bristles.

As stated above, in Osaka this is conducted entirely by the trade guild, the method adopted being to steam the bristles. They are placed in bamboo baskets which are arranged in a cylindrical iron vessel fixed over an apparatus for boiling water. This cylinder is perforated at the bottom to allow steam to enter, and there is an opening between the cover and the top through which the steam escapes. A thermometer projects from the top of the conical cover.

Heat is applied to the boiler under the vessel until the thermometer shows a temperature of 100 degrees C. inside the latter. The bristles are supposed to be subjected to steaming at this temperature for a period of three hours, although one hour is considered sufficient to destroy all germs. About 165 lb. of bristles can be steamed at once.

Disinfection by means of formalin has been tried, but abandoned, apparently owing to defective apparatus.

A certificate of disinfection is then issued to the brushmaker by the guild, and has to be returned with the brushes made from the bristles to which it relates. This is all the disinfection compulsory for brushes to be exported elsewhere than to Australia.

The prefectural authorities exercise no inspection of the operation of disinfection by the guilds. There is no safeguard against reinfection in course of manufacture, nor against substitution of bristles which have not been disinfected. Another disadvantage which might exist in places where only small numbers of shaving brushes are made, and no guild exists is, that the work of disinfection might be left to some minor official with little experience or knowledge of the treatment required.

Bacteriological

Bacteriological Test of Completed Brushes.

In Osaka this work has been entrusted to a private bacteriological laboratory. Samples of the consignments are selected by the guild and forwarded to the laboratory, where a portion of the bristles is cut off and subjected to cultivation.

The responsibility of this laboratory is confined to the samples submitted, and the question of destination is not their concern in any way.

The bristles used are horse, cow, goat, badger, and hog, of which the first-named are the largest in quantity and the most likely to be infected with anthrax germs.

Inspection of Tooth-brushes.

Tooth-brushes are in a different category. Nearly all the bristles used are white and they therefore require bleaching, which provides an effective method of disinfection. Inspection is consequently confined to the finished article intended for export, and is conducted by the Nippon Export Brush Trade Union Association, which is an association formed by the "dogyo kumiai," or guilds referred to above. The object of this inspection is to raise the standard of manufacture by preventing the export of goods which fall below the proper standard of workmanship and finish. No brushes not bearing the association's "passed" stamp are allowed through the Japanese Customs to foreign countries.

Disinfection of Shaving-brushes.

Investigations detailed in the preceding part of the paper indicate that a considerable number of infected brushes are at present or have been in the last few months on sale in Sydney and New South Wales, and probably many persons have purchased and used such brushes. Fortunately the actual number of cases has been small in comparison with the possibilities of infection. Experience has shown, however, that it is a new shaving-brush which is a source of danger. If infection is missed during the first few days the action of the soap and hot water on the brush probably tends to cleanse it and minimise the risk of infection.

For the protection of the public a method of disinfecting shaving-brushes was sought for that would ensure the efficient sterilisation of the brush without destroying it, and which would be at the same time simple enough to permit of its being employed by the general public. Two series of experiments have been carried out with this end in view. It is obvious that heat sterilisation could not be relied upon, as a temperature necessary to destroy anthrax spores would probably result in the majority of cases in the destruction of the shaving-brush. Attention was therefore turned to the phenol group of disinfectants and to formaldehyde as being the disinfectants most readily obtainable by the general public.

Series 1.—Naturally infected brushes were utilised in this experiment. The brushes selected were bone handled (G. 6,372), and had been proved by animal inoculation to be infected with anthrax. These brushes were labelled A, B, C, D, and F. They were immersed in different disinfectant fluids and left in the fluid for fifteen minutes, the temperature by this time dropping to about 37 deg. C.

Brush A was used as a control. It was soaked in free peptone water, and cultures made from the suspension thus obtained and portion injected into a guinea-pig. Though a similar suspension from this brush had previously killed a guinea-pig in three days, the guinea-pig on this occasion showed no signs of disease. It seems probable in this case that the washing of the brush had removed the anthrax spores.

Brush B was soaked for fifteen minutes in a 5 per cent. solution of phenol; removed, and washed in three changes of water. ·5 c.c. of the fluid which remained after the third washing was then injected into a guinea-pig, which died in three days from typical anthrax.

Brush C, treated in a similar manner to B, but with 1 per cent. of solution of sercsol in place of phenol. The guineapig injected from this brush died in four days from anthrax.

Brush D, soaked in 5 per cent. formaldehyde. The guinea-pig injected with a solution from this brush remained alive.

Brush F, soaked in 1 per cent. cyllin. A guinea-pig died in two days.

The results of this experiment are conclusive that so far as they demonstrate that phenol, sercsol, and cyllin in the strengths and at the temperature used were inefficient for the disinfection of the brushes. The evidence as regards formaldehyde cannot be regarded as conclusive as the control animal remained alives, howing that the original soaking of the brush utilised as the control had apparently removed the infection, and leaving the suspicion that the brush utilised in the formaldehyde experiment had been similarly rendered non-infective. On the other hand, cultures made from the suspensions of these brushes after disinfection and before inoculation show in all cases, except in that from the formaldehyde treated brush, abundant growth of sporing bacilli. A culture from the formaldehyde treated brush remained absolutely sterile.

In view of certain claims made by the agents for cyllin it was decided to test this disinfectant further.

G. 7,085.—Brush H, previously proved to be naturally infected with anthrax, was immersed in 1 per cent. solution of cyllin for one hour at the room temperature (22 deg. C.). The brush was then washed three times in changes of sterile water and ½ c.c. of the water remaining on the brush was injected into a guinea-pig, which died in three days with typical symptoms of anthrax.

Two brushes were infected by immersion in a broth suspension of anthrax spores and dried at 37 deg. C. in an incubator for three days.

G. 7,436 was immersed in a 1 per cent. cyllin solution for one hour in a water bath at 55 deg. C.

G. 7,437 was immersed in 2 per cent. cyllin solution for one hour in a water bath at 55 deg. C.

The brushes were then washed in three changes of sterile water and ½ c.c. of the water remaining on the brushes injected into guinea-pigs. Both died in three days with anthrax.

Disinfection by Means of Formaldehyde.

In view of the unsatisfactory results obtained by phenol disinfectants, attention was turned to the use of formaldehyde as a disinfectant.

This disinfectant had already been made the subject of extensive experiments in the disinfection of spores of anthrax in wool and hair by the Disinfection Sub-committee of the Departmental Committee on Anthrax in Great Britain. These experiments are too lengthy to be quoted here, but they led to the evolvement of a method in which formaldehyde is utilised as the disinfectant, its action being facilitated by washing and rolling the wool and finally drying it in a current of hot air. The object of the washing and rolling was to break up clot and enable the formaldehyde to reach the spores. It was shown that the

strength

strength (2·34 to 2·69 per cent.) and temperature (38 to 39 deg. C.) of the formaldehyde utilised both promoted disinfection; even after the formaldehyde bath some of the spores escaped disinfection, but the action of the formaldehyde was continued and increased by the drying process, which was carried out in the current of hot air (71 deg. to 75 deg. C.) for twenty-five minutes and by storing the dry wool for at least forty-eight hours.

In applying these experiments to the problem of disinfecting shaving-brushes it must be remembered that the conditions of infection of the two articles are different. In wool many of the anthrax spores are held in firm blood clot, which is only very slowly penetrated by the formaldehyde solution. These conditions do not pertain to the shaving-brushes, where the formaldehyde solution would have ready access to the spores, except possibly to those on the portions of the hairs embedded in cement.

In a report by Professor Delépine to the same sub-committee reference is made to a series of experiments carried out by him on the lethal action of watery formaldehyde solution at various temperatures upon anthrax spores. In these experiments Professor Delépine showed that exposure to 2·5 per cent. watery solution of formaldehyde was not sufficient to destroy anthrax spores at temperature not exceeding 20 deg. C. after a period of twenty-four hours, but at 30 deg. C. the spores were killed in one hour, and at 40 deg. C. after an exposure of fifteen minutes. Experiments with varying solutions of formaldehyde at 40 to 44 deg. C. showed that anthrax spores were killed in twenty minutes by 1 per cent. solution, in fifteen to twenty minutes by 2·5, and in two minutes by 4 per cent.

Series 2.—The brushes in this experiment were artificially infected by immersion in a broth suspension of anthrax spores and dried in the incubator at 37 deg. C. for three days. They were treated with varying strengths of formaldehyde at varying temperatures for a period of fifteen minutes.

Formaldehyde	1 per cent.	at 30 deg. C.,	40 deg. C.,	and 50 deg. C.	
	2·5 ,,	30 ,,	40 ,,	50 ,,	
	5 ,,	30 ,,	40 ,,	50 ,,	

After treatment the formaldehyde was neutralised by immersion of the brushes in a slight excess of ammonia and dried in the incubator for one day. Suspensions were then made by steeping in peptone water and ½ c.c. injected into a guinea-pig. All the guinea-pigs remained healthy, and were destroyed after nine days.

One of the brushes was not immersed in the formaldehyde solution and was used as a control. The guinea-pig injected from this brush died in two days with typical anthrax.

In view of these results it has been advocated that the public should sterilise new shaving-brushes by immersion in a solution of 5 per cent. formaldehyde (about 12·5 per cent. formalin) at a temperature of 55 deg. C. for half an hour. The strength and temperature here advocated are as will be seen from the experiments considerably in excess of those necessary to ensure the sterilisation of the brush, but it was thought better to allow a large margin for safety before advocating the method for use of the general public.

This method of treatment is very similar to the instructions issued by the Ministry of Health, Great Britain (Annual Report, 1919–20, p. 267) :—

> "Thoroughly wash the hair of the shaving-brush with soap and warm water, to which a little washing soda has been added, rinse in warm water, and then immerse for one hour in a disinfecting solution containing two tablespoonsful of formalin in half a pint of water. The disinfecting solution should be at a temperature slightly above the body heat. After removal from the disinfecting solution the brush should be allowed to dry before use."

It is not claimed that the formalin method will afford a certain safeguard against infection. The question of the penetration of the formalin into the mount has not been investigated. It is possible that the roots of the hairs where embedded in the mount may escape sterilisation, and later becoming loose may give rise to infection. On the other hand, however, in practically every case where brush infection has been proved, the brush in question was new or had not been used more than half a dozen times.

TABLE II.

Lab. No.	Type of Brush.	Retailer.	Wholesale Agent.	Manufacturer.	Animal Inoculation. Result.	Time.	Post Mortem.	Remarks.
G. 6177	Brown wooden handled	A.	B.	Japanese ...	Died	3 days ...	Anthrax	Case No. 1.
G. 6271 (1)	,, ...	A.	B.	,, ...	Killed	2 weeks ...	Healthy	Brushes from same source as infected brush in Case 1.
(2)	,, ...	A.	B.	,, ...	Died	4 days ...	Anthrax	
(3)	,, ...	A.	B.	,, ...	,, ...	3 ,, ...	,, ...	
(4)	,, ...	A.	B.	,, ...	,, ...	3 ,, ...	,, ...	
(5)	,, ...	A.	B.	,, ...	Killed.....	2 weeks....	Healthy	
(6)	,, ...	A.	B.	,, ...	,, ...	2 ,, ...	,, ...	
(7)	,, ...	A.	B.	,, ...	Died	3 days ...	Anthrax.....	
(8)	,, ...	A.	B.	,, ...	,, ...	3 ,, ...	,, ...	
(9)	,, ...	A.	B.	,, ...	,, ...	2 ,, ...	Post Mortem appearances of anthrax, but cultures and smears negative.	
G. 9121	Brown wooden handled (same as G. 6177).	B. 1	B.	,, ...	Discharged..	8 ,, ...	.....	G. 9121–6 were separate brushes, one from each of six boxes. Brushes of same type as brush implicated in Case 1.
G. 9122	,, ,, ...	B. 1	B.	,, ...	,, ...	8 ,, ...	.....	
G. 9124	,, ,, ...	B. 1	B.	,, ...	,, ...	8 ,, ...	.....	
G. 9125	,, ,, ...	B. 1	B.	,, ...	,, ...	8 ,, ...	.....	
G. 9126	,, ,, ...	B. 1	B.	,, ...	,, ...	8 ,, ...	.....	
G. 9123	,, ,, ...	B. 1	B.	,, ...	Died	4 ,, ...	Negative	No evidence of anthrax post mortem.
G. 9281	,, ,, ...	B. 1	B.	,, ...	Discharged	7 ,, ...	.....	G. 9281–6 were six brushes from the one box, belonging to the same lot of brushes as G. 9121–6.
G. 9283	,, ,, ...	B. 1	B.	,, ...	,, ...	7 ,, ...	.....	
G. 9284	,, ,, ...	B. 1	B.	,, ...	,, ...	7 ,, ...	.....	
G. 9285	,, ,, ...	B. 1	B.	,, ...	,, ...	7 ,, ...	.....	
G. 9286	,, ,, ...	B. 1	B.	,, ...	,, ...	7 ,, ...	.....	
G. 9282	,, ,, ...	B. 1	B.	,, ...	Died	4 ,, ...	Anthrax	One of the above lot

TABLE II.—*continued.*

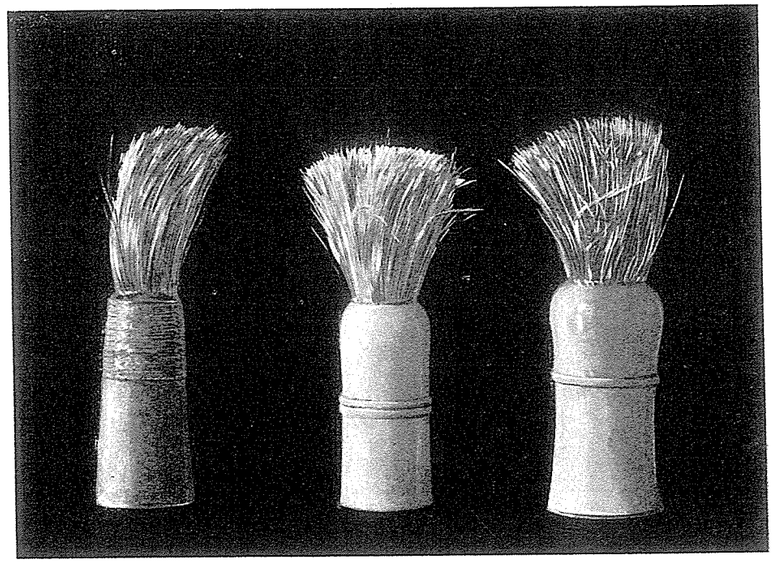
Lab. No.	Type of Brush.	Retailer.	Wholesale Agent.	Manufacturer.	Animal Inoculation. Result.	Time.	Post Mortem.	Remarks.
G. 10848	Brown wooden handled (same as G. 6177).	B. 2	B.	Japanese ...	Di d	3 days ...	Anthrax	One brush from each of the lots obtained from seven different retailers of brushes of the same type as that implicated in Case 1.
G. 10849	,, ,, ...	B. 3	B.	,, ...	,, ...	2 ,, ...	,, ...	
G. 10850	,, ,, ...	B. 4	B.	,, ...	,, ...	3 ,, ...	,, ...	
G. 10851	,, ,, ...	B. 5	B.	,, ...	,, ...	3 ,, ...	,, ...	
G. 10852	,, ,, ...	B. 6	B.	,, ...	,, ...	3 ,, ...	,, ...	
G. 10853	,, ,, ...	B. 7	B.	,, ...	,, ...	2 ,, ...	,, ...	
G. 10854	,, ,, ...	B. 8	B.	,, ...	,, ...	2 ,, ...	,, ...	
G. 6271A	White composition handled.	A.	.....	,, ...	,, ...	3 ,, ...	,, ...	From same shop as brush from Case 1, a different brand.
G. 4159	White handled (*See* G. 6271A).	A.	.....	,, ...	,, ...	2 ,, ...	,, ...	Brushes of same type as G. 6271A.
G. 4160	,, ,, ...	A.	.....	,, ...	,, ...	11 ,, ...	Not anthrax...	
G. 7019	Varnished, brown-wooden handled.	D. Glen Innes.	2 Assyrian firms, Sydney.	,, ...	,, ...	4 ,, ...	Anthrax	From Case 2.
G. 7802	Varnished, dark reddish brown wooden handle.	D. ...	,, ...	,, ...	,, ...	3 ,, ...	,, ...	Brushes from same source as brush in Case 2, same design, but different colour.
G. 7803	Varnished black wooden handle.	D.	,, ...	,, ...	,, ...	3 ,, ...	,, ...	
G. 7505	Compo. handle with black band (held in rubber).	F.	G.	American ...	Killed	7 ,, ...	Healthy	Brush from Case 3.
G. 7832	,, ,, ...	F.	G.	,, ...	Discharged	6 ,, ...	.....	Of same type, but different shape from the brush from Case 3. Guinea pigs discharged after six days, but kept in separate pen afterwards, and showed no evidence of anthrax.
G. 7833	,, ,, ...	F.	G.	,, ...	,, ...	6 ,, ...	.....	
G. 7834	,, ,, ...	F.	G.	,, ...	,, ...	6 ,, ...	.....	
G. 7829	,, ,, ...	G.	G.	,, ...	,, ...	6 ,, ...	.....	
G. 7830	,, ,, ...	G.	G.	,, ...	,, ...	6 ,, ...	.....	
G. 7831	,, ,, ...	G.	G.	,, ...	,, ...	6 ,, ...	.....	
G. 7929	,, ,, ...	Orange	.....	Japanese ...	,, ...	10 ,, ...	.....	Brush from Case 4.
G. 8731	Wooden handle, string bound.	I.	I.	? ...	,, ...	7 ,, ...	.....	Brush from Case 5.
G. 8780	,, ,, ...	I.	I.	? ...	Died	3 ,, ...	Anthrax	Brushes of same type and from same source as brush from Case 5 (G. 8731).
G. 8781	,, ,, ...	I.	I.	? ...	Discharged	8 ,, ...	.....	
G. 8782	,, ,, ...	I.	I.	?	,, ...	8 ,,	.....	Albury investigations (Patient's brush said to be of this type, Case 6).
G. 9383	White wooden handle, bound with string.	K.	Unknown ...	? ...	,, ...	11 ,, ...	.....	
G 9384	,, ,, ...	K. ...	,, ...	? ...	,, ...	11 ,, ...	.....	
G. 9385	,, ,, ...	L. ...	Assyrian firm, Sydney, five years previously.	? ...	,, ...	11 ,, ...	.....	Somewhat different brush to G. 9383–4—Same type as G. 8731 (Case 5).
G. 9386	,, ,, ...	L. ...	,, ...	? ...	Died	3 ,, ...	Anthrax	
G. 9641	Wooden handled, varnished.	M.	N. (Melbourne).	Japanese ...	Discharged	11 ,, ...	.....	See Albury investigations.
G. 9642	,, ,, ...	M.	,, ...	,, ...	,, ...	11 ,, ...	.....	
G. 9643	Wooden handled varnished, different pattern to G. 9341.	M.	,, ...	? ...	,, ...	11 ,, ...	.....	,, ,,
G. 9344	,, ,, ...	M.	,, ...	?	,, ...	11 ,, ...	.....	,, ,,
G. 9655	Wooden handle with pointed end; string bound.	O.	P. (Melbourne).	?	,, ...	12 days ...	.....	,, ,,
G. 9656	,, ,, ...	O.	,,	? ...	,, ...	12 ,, ...	.....	,, ,,
G. 9657	Black wooden handle ...	Q.	.....	French	,, ...	12 ,, ...	.....	,, ,,
G. 9658	Wooden handled, varnished.	Q. ...	.....	?	,, ...	12 ,, ...	.....	,, ,,
G. 9659	Black wooden handle, different shape to G. 9657.	R.	Unknown ...	?	,, ...	12 ,, ...	.....	,, ,,
G. 9660	Black wooden handle, bound with metal around roots of hairs.	R.	Unknown	? ...	,, ...	12 ,, ...	.....	,, ,,
G. 9345	Black wooden handle with metal cap, different type to I. 9660	Stores Supply Dept.	.....	.....	,, ...	11 ,, ...	.....	
G. 12120	White handled brush with 1 ring.	Bankstown	.....	? ...	(*a*) Discharged.	11 ,, ...	.....	Brush from Case 7.— (*a*) Guinea-pig inoculated with washings from bristles.
					(*b*) ,,	7 ,, ...	.....	(*b*) Guinea-pig inoculated with washings from hairs pulled out of mount.
G. 12249	,, ,, ...	,, ...	.....	? ...	Died	4 ,, ...	Anthrax	From same retailer and of same type as brush from Case 7.
G 12222	White handled brush with 2 rings.	Junee	S.	Japanese.....	(*a*) Discharged.	10 ,, ...	.....	Brush from Case 8. (*a*) Guinea-pig inoculated with washings from bristles.
					(*b*) Died	3 ,, ...	Anthrax	(*b*) Guinea-pig inoculation with washings from mount.
G. 12223	,, ,, ...	.....	.....	,, ...	Discharged...	10 ,, ...	.....	From same shop as G. 12222.
G. 12223A	Wooden handle, white top.	.....	.....	,, ...	,, ...	10 ,, ...	.....	,, ,,
I. 2777	White bone handled with 2 rings (different pattern to G. 12222).	T.	.....	,, ...	(*a*) Discharged.	12 ,, ...	.....	Brush from Case 9. (*a*) Guinea-pig inoculated with washings from bristles.
					(*b*) Died ...	4 ,, ...	Anthrax	(*b*) Guinea-pig inoculated with washings from mount.
I. 3830	,, ,, ...	.....	.....	,, ...	Died	3 ,, ...	Anthrax	Brushes of same type as I. 2777 from same retailer. Brushes from separate boxes.
I. 3831	,, ,, ...	.....	.....	,, ...	,, ...	3 ,, ...	,, ...	
I. 3832	,, ,, ...	.....	.....	,, ...	,, ...	3 ,, ...	,, ...	
I. 4999	Black handled, varnished,	Sydney	.....	,, ...	(*a*) Discharged.	12 ,, ...	.....	Brush from Case 10— (*a*) Guinea-pig inoculated with washings from bristles.
					(*b*) Died ...	3 ,, ..	Anthrax	(*b*) Guinea-pig inoculated with washings from mount.
I. 4647	White handled, same type as I. 2777.	Queanbeyan	T	,, ...	Died	4 ,, ...	Anthrax	Brush from Case 11 of same type as brush in Case 9. Guinea-pig inoculated with washings from mount.
I. 7867	Brown wooden handled (Same as G. 6177).	?	.....	,, ...	Discharged	15 ,, ...	.....	Brush from Case 12; of same type as in Case 1.
I. 7989	White bone handled with 2 ridges.	U.	.....	? ,, ...	,, ...	13 ,, ...	.....	Brush used by Case 13.
I. 8413	White bone handled (same as I. 7989).	U.	.....	? ,, ...	,, ...	17 ,, ...	.....	Of same type and from same vendor as brush used by patient in Case 13.
I. 8414	,, ,, ...	U	.....	? ,, ...	Died	4 ,, ...	Anthrax	
I. 7990	Brown wooden handled with nail in base of handle.	V.	.....	? British ...	,, ...	3 ,, ...	,,	Brush purchased by patient (Case 13) but not used.
I. 8370A	Same as I. 7990	V.	.....	? ,, ...	Discharged	17 ,, ...	.....	Two out of 32 brushes from same source as I. 7990.
I. 8371B	,, ...	V.	.....	,, ...	,, ...	17 ,, ...	.....	Of same type as I. 7990, and said to be of British Manufacture.
I. 8369	,, ...	W.	.....	,, ...	,, ...	17 ,, ...	.....	

TABLE II.—*continued.*

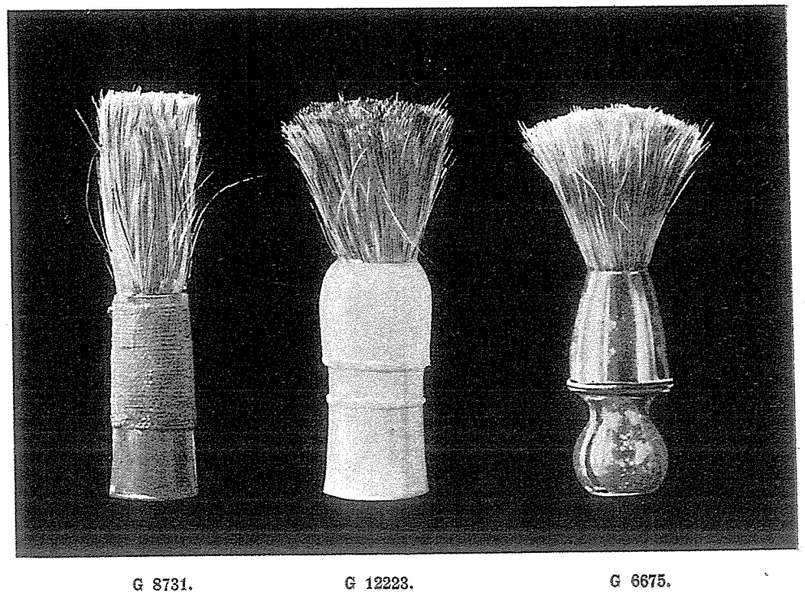
Lab. No.	Type of Brush.	Retailer.	Wholesale Agent.	Manufacturer.	Animal Inoculation. Result.	Time.	*Post Mortem.*	Remarks.
G. 7801	Same as I. 7990	Glen Innes	.....	British ...	Discharged	10 days...	.....	Two out of five brushes obtained from retailer in Glen Innes.
G. 7804	,, ...	,, ...	.....	,, ...	,, ...	10 ,, ...	.....	
I. 8368	Black wooden handled white bristles.	X.	.....	,, ...	,, ...	17 ,, ...	.....	Of similar type to brush implicated in Case 10, but with different bristles; and doubtfully from same shop.
I. 8606	White bone handled, no ridges.	? ...	.....	Japanese.....	,, ...	10 ,, ...	.....	Brush from Case 14 in use for 6 months.
I. 8587	Brown wooden handle with vulcanite mount.	New Guinea	.....	American ...	,, ...	10 ,, ...	.....	Brush from patient who died with pustule on face not regarded as anthrax.
	Miscellaneous—							
G. 6372	A. Bone handled	.....	B.	Japanese ...	Died	3 ,, ...	Anthrax	From same importer as brush implicated in Case 1, but imported this year with certificate of disinfection.
	B. ,, ...	.....	B.	,, ...	,, ...	2 ,, ...	,, ...	
	C. ,, ...	.....	B.	,, ...	,, ...	3 ,, ...	,, ...	
	D. ,, ...	.....	B.	,, ...	,, ...	2 ,, ...	,, ...	
	E. ,, ...	.....	B.	,, ...	Killed	2 weeks	Healthy.	
	F. ,, ...	.....	B.	,,	Died	4 days ...	Anthrax	
G. 6936	G. ,, ...	.....	B.	,, ...	Killed	2 weeks.	Healthy	G. was sick on 4th day, but recovered. Brushes from same source as G. 6372.
	H. ,, ...	.....	B.	,, ...	Died	4 days ...	Anthrax	
G. 6675	Metal handled	C.	C.	,, ...	,, ...	2-3 ,,	,, ...	Sample of a lot imported twelve months previously, stated to have certificate of disinfection.
G. 7883	,, ...	C.	C.	,, ...	Discharged	11 ,, ...	.....	Of same type as G. 6675.
G. 7884	,, ...	C.	C.	,, ...	,, ...	11 ,, ...	.....	,, ,,
I. 4157	Metal handled (See G. 6675).	C.	C.	,,	,, ...	12 ,, ...	.....	Brushes of same type as G. 6675, from separate boxes.
I. 4158	,, ,, ...	C.	C.	,, ...	Died	11 ,, ...	Not anthrax ..	
G. 7669	White handled	C.	C.	,, ...	Discharged	.....	.....	Two tested out of box of six.
G. 7670	,, ...	C.	C.	,, ...	,, ...	.....	.....	
G. 7330	Rough brown wooden handle.	E.	C.	,, ...	,, ...	7 ,, ...	.....	
G. 7331	Smooth brown wooden handle.	E.	.....	,, ...	,, ...	7 ,, ...	.....	Odd sample brushes not infected. Guinea-pigs discharged, remained well since.
G. 7332	Bone handle	E.	.....	,, ...	,, ...	7 ,, ...	.....	
G. 7333	White composition handle.	E.	.....	,, ...	,, ...	7 ,, ...	.....	
G. 7334	,, ,, ...	E.	.....	,, ...	,, ...	7 ,, ...	.....	
G. 7545	,, ,, ...	E.	.....	,, ...	,, ...	7 ,, ...	.....	
G. 7546	,, ,, ...	E.	.....	,, ...	Died	24 hours	? Muco-enteritis, not anthrax.	Odd sample brush.
G. 7543	Composition handle	H.	.....	,, ...	Discharged	.....	.....	Odd sample brushes.
G. 7544	,, ...	H.	.....	,, ...	,, ...	.....	.....	

TABLE III.

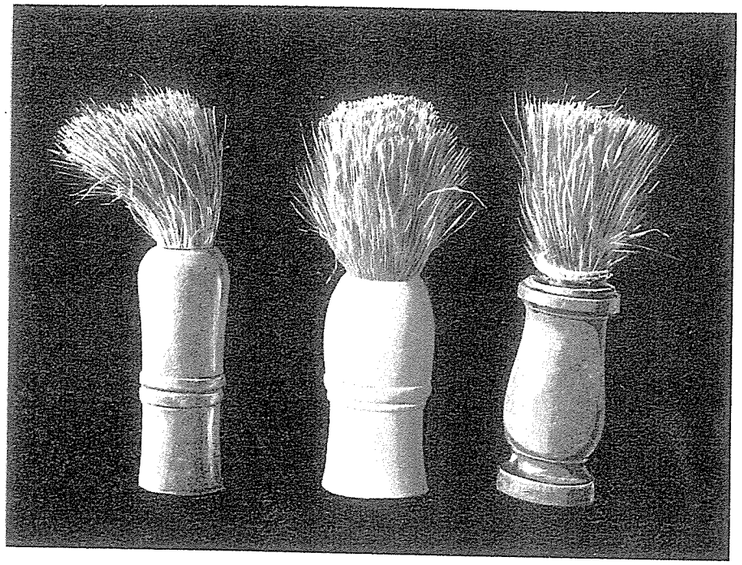
Brush.	Disinfectant.	How Infected.	Period of Disinfection. Temperature before.	Time.	Temperature after.	After Treatment.	Animal Inoculation. Result.	Time.	*Post mortem.*	Remarks.
G. 7194 A.	Control	Naturally ...	.....	.....	.....	.....	Killed...	12 days	Healthy	Brushes used in experiment had been proved by previous test to be infected.
B.	Phenol, 5 per cent....	,, ...	47° C.	15 mins.	37° C.	Washed three times.....	Died ...	3 ,,	Anthrax	
C.	Sercsol, 1 per cent. ...	,, ...	47° C.	15 mins.	Not taken.	,, ...	,, ...	4 ,,	,, ...	
D.	Formaldehyde, 5 per cent.	,, ...	47° C.	15 mins.	38° C.	,, ...	Killed...	12 ,,	Healthy	
F.	Cyllin, 1 per cent.....	,, ...	47° C.	15 mins.	33° C.	,, ...	Died ...	2 ,,	Anthrax	
G. 7035 H.	,, ...	,, ...	22° C.	1 hour...	.....	,, ...	,, ...	3 ,,	,, ...	
G. 7436	,, ...	Artifically ...	55° C.	1 hour...	.....	,, ...	,, ...	3 ,,	,, ...	
G. 7437	Cyllin, 2 per cent.....	,, ...	55° C.	1 ,, ...	.....	,, ...	,, ...	3 ,,	,, ...	
G. 7426	Control	,, ...	.....	.....	.....	.....	,, ...	2 ,,	,, ...	
G. 7427	Formaldehyde— 1 per cent.....	,, ...	30° C.	15 mins.	.....	Immersed in 100 c.c., 4 per cent. ammonia, 10 minutes.	Killed...	9 ,,	Healthy	Brushes infected by immersion in broth suspension of Anthrax spores, and dried in incubator at 37° C. for three days.
G. 7428	1 per cent.....	,, ...	40° C.	15 ,,	.....	,, ,,	,,	9 ,,	,,	
G. 7429	1 per cent.	,, ...	50° C.	15 ,,	.....	,, ,,	,, ...	9 ,,	,,	
G. 7430	2·5 per cent.	,, ...	30° C.	15 ,,	.....	Immersed in 100 c.c., 9 per cent. ammonia, 10 minutes.	,,	9 ,,	,,	
G. 7431	2·5 per cent.	,, ...	40° C.	15 ,,	.....	,, ,,	,, ...	9 ,,	,,	
G. 7432	2·5 per cent.	,, ...	50° C.	15 ,,	.....	,, ,,	,,	9 ,,	,,	
G. 7433	5 per cent.	,, ...	30° C.	15 ,,	.....	Immersed 100 c.c., 1·9 per cent. ammonia, 10 minutes.	Killed...	9 ,,	,,	
G. 7434	5 per cent.....	,, ...	40° C.	15 ,,	.....	,, ,,	,,	9 ,,	,,	
G. 435	5 per cent.....	,, ...	50 °C.	15 ,,	.....	,, ,,	,,	9 ,,	,,	



G 9383. G 6271A. G 12249.

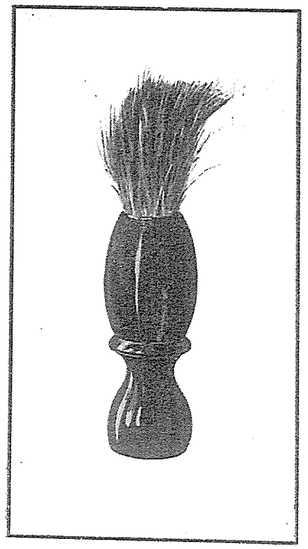


G 8731. G 12223. G 6675.



I 7867. I 7989. I 7990.

I 2777.



I 4099.

Division II.—Pathological Tissues.

TUMOUR OF THE CAROTID BODY.

By J. B. Cleland, M.D., Ch.M.; E. W. Ferguson, M.B., Ch.M.; and E. L. Morgan, M.B., Ch.M.

(From the Microbiological Laboratory, Department of Public Health, Sydney.

A rare and interesting tumour was recently received from the Orange District Hospital, with the information that it was a "growth removed from the neck." The tissue did not resemble any of the ordinary tumours met with in the neck region, so it became necessary to consider the various structures of this region for a possible source of an unusual growth. The carotid body suggested itself, and on reference the neoplasm was found to agree with the descriptions and illustrations of certain tumours of this structure, and this opinion was confirmed by the fact that a large artery was found traversing the growth. Our opinion was then conveyed to the Orange District Hospital, and we received the following clinical notes from Doctors Howse and Paton.

"Mrs. A.M., æt. 28, consulted them on 15th October about a lump on the left side of her neck. The lump was about the size of a bantam's egg, seemed movable, and was situated between the angle of the jaw and the sterno-mastoid muscle. It had been first noticed nine years previously after an 'abscess in left ear,' and grew gradually larger. During the last twelve months, however, it had increased rapidly and doubled in size. It became painful whenever the throat was inflamed, but otherwise caused no symptoms.

"On 11th November an incision was made over the lump, which was found to be lying on the bifurcation of the common carotid artery. Much difficulty was encountered in separating the mass from surrounding structures, and a large vessel was seen entering the lower and emerging from the upper pole."

Macroscopically the tissue was of a firm whitish fibrous texture, with a large artery running through portion of the growth. It had been divided into several portions, so no idea could be obtained of the original shape or size of the mass.

Microscopically, the growth showed a rather dense fibrous capsule. This sends a few irregular coarse septa into the tumour, dividing it into indefinite lobules. In the lobules the septa break up into fine interlacing strands. Each of the numerous loculi thus formed is partly filled by a body rather resembling a glomerulus of the kidney. These glomerule-like bodies are composed of rather large irregular connective tissue cells with large nuclei embedded in a matrix, and occasionally show a few small spaces. The walls of the cavity in which they lie are lined by somewhat flattened elongated cells. These cells in a little fibrous stroma form the interlacing strands above referred to.

Sections from one part show the glomerule-like bodies nearly or completely filling the spaces; in another section there is a distinct interval between the bodies and the wall. The coarse stroma shows in places cells approaching the myxomatous type.

"Adami and Nicholls" describe these tumours as highly vascular peritheliomata, in which the lobular arrangement of the gland is maintained.

"Delafield and Prudden" mention as well a diffuse form more resembling a carcinoma. They call the tumour a paraganglioma, from its origin in the parasympathetic system, or a phaochromoblastoma, on account of the yellowish hue assumed by the cells after fixation in solutions of chrome salts. They are usually described as slow-growing benign neoplasms, although metastasis or recurrence has been described in some cases in which the structure of the carotid gland has been reproduced.

RODENT ULCERS AND ALLIED GROWTHS.*

An Analysis of Sixty Australian Cases.

By J. Burton Cleland, M.D., Professor of Pathology, University of Adelaide (formerly Principal Microbiologist, Department of Public Health, Sydney); and Norman Paul, M.B., Ch.M., Honorary Dermatologist, Royal Alexandra Hospital for Children; Honorary Assistant Dermatologist, Sydney Hospital.

A number of new growths of the skin, either definite rodent ulcers, or resembling these more or less closely, having been submitted to us for microscopical examination, it seems advisable to place on record our finding, more particularly with regard to the various classifications of these neoplasms. The experience of one of us is that rodent ulcers are much more prevalent in Australia, certainly in New South Wales, than they are in Great Britain.

The series here reviewed comprise about sixty new growths, most of them belonging to this group, which have been submitted to the Microbiological Laboratory of the Department of Public Health for examination during the past eleven years. These do not comprise all the neoplasms probably of this nature submitted, inasmuch as a number have not been included owing to scanty material or for other reasons. It will, therefore, be seen that our experience with the microscopic appearances of these new growths has been fairly extensive.

In discussing the nature and origin of most of these neoplasms of the skin, we may first state our opinion that the majority of them, certainly the rodent ulcer group, are of epiblastic origin and are not endotheliomata. In this connection vascular nævoid growths are of course excluded. We consider that melanomata are still open to discussion as to their nature.

In considering the histology of the different types of growths met with, the ontogenetic development of the epiblast must be considered. It must be admitted that, to a certain extent at least, the type of epiblastic development depends upon the situation where the cells find themselves. Thus the epiblast covering the chorionic villi forms a syncytium and Langhan's layer of cells. Other cells, similarly derived, form on the surface of the body a stratified epithelium. Generally, growths from such surface epithelium, which

* Reprinted from *The Medical Journal of Australia*, 1st May, 1920.