caused temporary anxiety, owing to pallor and great rapidity of the pulse.

After-history.

Recovery from the anaesthetic was prompt and complete, and in the evening her condition was satisfactory. The only unusual feature was a pulse-rate of 120. Throughout the following day the course of the case was uneventful. There was no vomiting, the temperature was normal, and the mental condition quite bright. The pulse, however, continued at 120, both in the morning and evening. Next morning (December 13th) nothing unusual was seen till 9 a.m., when the child suddenly sat up in bed and cried out "Sister" in terror-stricken tones. The Sister had scarcely reached the bedside when the child fell back dead. There was, however, time to note that the pulse was feeble and quite beyond count in the moment before death.

Necropsy.

On the following day a very exhaustive *post-mortem* examination was made by Dr. Anderton. A trace of pus was found on the gauze drains; this was no more than might be expected in a wound involving two septic sinuses. The aspect of the wound both in its superficial and deeper parts was quite satisfactory. All the deep structures of the neck, including the cervical portion of the vagus nerve, were normal in appearance. The whole of the thoracic and abdominal viscera were closely examined with negative result. There was no indication of any acute septic infection, nor was there anything to suggest that the fatal issue was due to the delayed action of chloroform. The brain and its vessels were in a perfectly healthy condition on naked-eye examination.

On tracing the right vagus nerve into the chest a very suggestive condition was found. At the level of the first dorsal vertebra the nerve disappeared into an elongated mass the size of a large filbert, formed by the fusion of several enlarged and tuberculous glands. The nerve was distinctly swollen for 1 in. before its entry into the mass, whilst at the point of entry it was actually constricted as definitely and sharply as if it had been encircled by a ligature. The interior of the mass contained soft caseous debris, and the fibres of the nerve were frayed out in their course through it. At the point of exit and throughout its subsequent course the nerve was normal.

Brouardel quotes a case of sudden death in which the *post-mortem* findings offer a striking parallel to those observed in the present instance.

On the other hand, the vagus has frequently been injured or divided in surgical work on the human subject, and such division does not appear to have produced any noteworthy results either immediate or remote. I have notes of one case in which 2 in. of the left vagus were deliberately excised during the removal of a mass of secondary epitheliomatous glands from the neck. Attention was specially directed to the pulse-rate and respiration rhythm at the moment of section, but no effect was found. The patient was alive and well six months after the operation. One of the conclusions reached by Roy and Adami in their classical research on the mammalian heart is "that the influence of the nerve on the heart is limited, so that the economy as a whole is not endangered even by the most powerful functional activity of the vagus mechanism."

At the meeting of the German Ophthalmological Society held at Heidelberg on August 6th, the Graefe Medal was awarded to Professor Hering, of Leipzig.

THE twenty-sixth annual meeting of the Caledonian Medical Society was held at Stirling on July 13th, under the presidency of Dr. W. A. Mackintosh of Stirling. There was a representative attendance from both sides of the Border. The honorary secretary (Dr. Macphail of Derby) gave his report, which showed the membership to be 232, or double what it was ten years ago. Financially also the society was stronger than it ever had been, and the *Journal* published quarterly by the society had increased its circulation. Dr. Andrew Little of Bradford was elected president for the ensuing year. In his presidential address, Dr. Mackintosh spoke of the present position and prospects of the Gaelic language, and his address was an able and forcible plea for the teaching and study of Gaelic. The annual dinner was held the same evening. The menu card, designed and beautifully illustrated with local views by Mr. J. G. Murray, was entirely in Gaelic. A motto from Galen in the original Latin with an old Gaelic translation from a curious and valuable MS. in the president's possession appeared on the frontispiece, which also showed the crest of the society—an armed Highlander battling with the skeleton Death, and the motto "Is Rìgh Gach Slàn." The toast of the evening was proposed in a racy and witty speech by the Rev. Lachlan Maclean Watt, Alloa, a well-known Celt and poet.

British Medical Association.

REPORT

TO THE

THERAPEUTIC COMMITTEE.

THE BACTERICIDAL ACTION OF COMPOUNDS OF SILVER.

BY

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THE COMMITTEE.

THIS research was undertaken at the request of the Therapeutic Committee of the British Medical Association. Owing to the extensive use of silver compounds as bactericidal agents in certain diseases, it seemed to the Committee desirable that a comparison of the value of these compounds should be made by disinterested observers. For this purpose all the silver compounds in common use were bought from a retail pharmacist. The percentage of silver in each was determined in most cases by incinerating, heating with nitric acid, dissolving in water, and titrating with centinormal ammonium sulphocyanide solution, with the following results:

	Percentage of Ag.
Collargol	86.6
Silver fluoride	81.7
Silver nitrate	63.6
Itrol	60.8
Actol	51.5
Argentol	31.2
Ichthargan	27.1
Argyrol... ..	20.0
Albargin	13.4
Nargol	9.6
Largin	9.4
Novargan	7.9
Protargol	7.4
Argentamine	6.4
Argonin	3.8

These results were used in preparing the various solutions. Each solution was made to contain a definite percentage of silver. This appeared to be the only method available for comparison, as equimolecular solutions could not be employed owing to the composition of many of the substances being unknown. It is only necessary to draw attention to the fact that a 25 per cent. solution of argyrol practically corresponds to an argyrol solution containing 5 per cent. silver; a half per cent. solution of protargol to one containing 0.04 per cent. silver, etc.

BACTERICIDAL ACTION.

The bactericidal effect was determined both on a mixed culture and on a pure culture of *Staphylococcus pyogenes aureus*. In every experiment a control was made, and this invariably showed growth after remaining twenty hours in the incubator.

Experiments with a Mixed Culture.

The fluid for these experiments was obtained by allowing uncooked beef to stand in water in an open vessel for four to six weeks. It was strained just previous to use. To 5 c.cm. of this fluid sufficient sterilized water and solution of a silver compound were added to make the whole 10 c.cm. A loopful of this mixture was transferred to 10 c.cm. of sterilized broth at intervals of five, ten, and twenty minutes, and the inoculated broth was incubated at a temperature of 38° C. This method approaches somewhat the conditions actually met with in therapeutics, since the meat fluid contained both albumins and chlorides; 5 c.cm. of meat infusion when treated with excess of silver nitrate solution gave a precipitate which when dried contained 0.0256 Ag. Of this 0.0236 g. Ag appeared to be combined with albumins and 0.0021 g. Ag with chlorides.

The following results were obtained: + indicates growth; 0 indicates no growth. The experiments indicating limit of action are alone given.

SILVER NITRATE.

	1st Day.	2nd Day.	10th Day.
0.02 per cent. Ag for 5 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	+		
0.01 per cent. Ag for 10 minutes	0	+	
0.01 per cent. Ag for 20 minutes	0	0	0

SILVER FLUORIDE.

	1st Day.	2nd Day.	3rd Day.
0.02 per cent. Ag for 10 minutes	+		
0.02 per cent. Ag for 20 minutes	0	0	0
0.01 per cent. Ag for 20 minutes	+		

ACTOL.

	1st Day.	2nd Day.	10th Day.
0.01 per cent. Ag for 5 minutes	0	0	0
0.005 per cent. Ag for 5 minutes	0	+	
0.005 per cent. Ag for 10 minutes	0	0	0
0.0025 per cent. Ag for 10 minutes	+		
0.0025 per cent. Ag for 20 minutes	0	0	0
0.001 per cent. Ag for 20 minutes	+		
0.001 per cent. Ag for 24 hours	0	0	0

ITROL.

	1st Day.	2nd Day.	10th Day.
0.01 per cent. Ag for 5 minutes	0	0	0
0.005 per cent. Ag for 10 minutes	+		
0.005 per cent. Ag for 20 minutes	0	0	0
0.002 per cent. Ag for 10 minutes	+		
0.002 per cent. Ag for 20 minutes	0	0	0

ARGENTAMINE.

	1st Day.	2nd Day.	10th Day.
0.02 per cent. Ag for 5 minutes	0	+	
0.02 per cent. Ag for 10 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	0	+	
0.01 per cent. Ag for 10 minutes	0	0	0
0.005 per cent. Ag for 20 minutes	+		
0.005 per cent. Ag for 19 hours	0	0	0

PROTARGOL.

	1st Day.	2nd Day.	10th Day.
0.02 per cent. Ag for 5 minutes	0	+	
0.02 per cent. Ag for 10 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	0	+	
0.01 per cent. Ag for 10 minutes	0	0	0
0.005 per cent. Ag for 20 minutes	+		
0.005 per cent. Ag for 19 hours	0	0	0

LARGIN.

	1st Day.	2nd Day.	3rd Day.
0.02 per cent. Ag for 5 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	0	0	+
0.01 per cent. Ag for 10 minutes	0	0	0
0.005 per cent. Ag for 10 minutes	+		
0.005 per cent. Ag for 20 minutes	0	+	

ICHTHARGAN.

	1st Day.	2nd Day.	10th Day.
0.02 per cent. Ag for 5 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	0	+	
0.01 per cent. Ag for 10 minutes	0	0	0
0.005 per cent. Ag for 10 minutes	+		
0.005 per cent. Ag for 20 minutes	0	+	

ALBARGIN.

	1st Day.	2nd Day.	10th Day.
0.02 per cent. Ag for 5 minutes	0	+	
0.02 per cent. Ag for 10 minutes	0	0	0
0.01 per cent. Ag for 5 minutes	+		
0.01 per cent. Ag for 10 minutes	+		
0.01 per cent. Ag for 20 minutes	0	0	0
0.005 per cent. Ag for 20 minutes	+		

NOVARGAN.

	1st Day.	2nd Day.	10th Day.
0.05 per cent. Ag for 5 minutes	+		
0.05 per cent. Ag for 10 minutes	0	0	0
0.02 per cent. Ag for 10 minutes	+		
0.02 per cent. Ag for 20 minutes	0	0	0
0.01 per cent. Ag for 10 minutes	+		
0.01 per cent. Ag for 20 minutes	0	0	0
0.005 per cent. Ag for 20 minutes	+		

ARGONIN.

	1st Day.	2nd Day.	10th Day.
0.05 per cent. Ag for 5 minutes	0	0	0
0.04 per cent. Ag for 5 minutes	+		
0.04 per cent. Ag for 10 minutes	0	+	
0.04 per cent. Ag for 20 minutes	0	0	0
0.02 per cent. Ag for 10 minutes	+		
0.02 per cent. Ag for 20 minutes	0	+	
0.01 per cent. Ag for 20 minutes	+		

ARGYROL.

	1st Day.	2nd Day.	10th Day.
5 per cent. Ag for 20 minutes	+		
1 per cent. Ag for 72 hours	0	0	0
0.5 per cent. Ag for 72 hours	0	+	

ARGENTOL.

	1st Day.	2nd Day.	10th Day.
0.03 per cent. Ag for 5 minutes	0	+	
0.03 per cent. Ag for 10 minutes	0	+	
0.03 per cent. Ag for 20 minutes	0	0	0
0.02 per cent. Ag for 20 minutes	+		

NARGOL.

	1st Day.	2nd Day.	3rd Day.	4th Day.
0.1 per cent. Ag for 5 minutes	0	+		
0.1 per cent. Ag for 10 minutes	0	0	0	0
0.02 per cent. Ag for 5 minutes	+			
0.02 per cent. Ag for 10 minutes	0	0	0	0
0.01 per cent. Ag for 10 minutes	+			
0.01 per cent. Ag for 20 minutes	0	0	0	+

COLLARGOL.

	1st Day.	2nd Day.	10th Day.
4 per cent. Ag for 10 minutes	+		
4 per cent. Ag for 20 minutes	0	0	0
2 per cent. Ag for 20 minutes	+		
1 per cent. Ag for 23 hours	0	0	0
0.5 per cent. Ag for 23 hours	0	+	

Experiments with a Pure Culture of *Staphylococcus Pyogenes Aureus*.

The method employed was the ordinary thread method. Such threads, 20 mm. long, were digested in boiling alcohol and in ether, and afterwards dried. They were subsequently infected with an emulsion of *Staphylococcus pyogenes aureus* in water and dried in an evacuated desiccator over calcium chloride for eighteen to twenty hours. The threads were then subjected to the action of various strengths of the different compounds for five, ten, and twenty minutes, and after being washed for about ten minutes in three different quantities of about 20 c.cm. of sterile water were put into sterilized broth. Controls were always made, and invariably showed growth on the first day.

SILVER NITRATE.

	1st Day.	10th Day.
0.001 per cent. Ag for 5 minutes	0	0
0.0075 per cent. Ag for 5 minutes	+	
0.0075 per cent. Ag for 10 minutes	0	0
0.005 per cent. Ag for 10 minutes	+	
0.005 per cent. Ag. for 20 minutes	0	0

SILVER FLUORIDE.

	1st Day.	10th Day.
0.002 per cent. Ag for 5 minutes	0	0
0.001 per cent. Ag for 5 minutes	+	
0.001 per cent. Ag for 10 minutes	0	0

ACTOL, LARGIN, ICHTHARGAN, NOVARGAN gave exactly the same results as Silver Fluoride.

ARGENTAMINE.

	1st Day.	10th Day.
0.004 per cent. Ag for 5 minutes	0	0
0.002 per cent. Ag for 5 minutes	+	
0.002 per cent. Ag for 10 minutes	0	0
0.001 per cent. Ag for 10 minutes	+	
0.001 per cent. Ag for 20 minutes		

PROTARGOL.

	1st Day.	2nd Day.	10th Day.
0.002 per cent. Ag for 5 minutes	+		
0.002 per cent. Ag for 10 minutes	0	0	0
0.001 per cent. Ag for 20 minutes	0	+	

ALBARGIN.

	1st Day.	10th Day.
0.004 per cent. Ag for 5 minutes	+	
0.004 per cent. Ag for 10 minutes	0	0
0.002 per cent. Ag for 10 minutes	+	
0.002 per cent. Ag for 20 minutes	0	0
0.001 per cent. Ag for 20 minutes	+	

NARGOL.

	1st Day.	10th Day.
0.02 per cent. Ag for 10 minutes	+	
0.02 per cent. Ag for 20 minutes	0	0
0.01 per cent. Ag for 20 minutes	+	

ARGYROL.

	1st Day.	10th Day.
10 per cent. Ag for 2 hours	+	
10 per cent. Ag for 23 hours	0	0

COLLARGOL.

	1st Day.	10th Day.
10 per cent. Ag for 80 minutes	+	
10 per cent. Ag for 120 minutes	0	0

ANTISEPTIC ACTION.

This was determined in two ways—(1) by observing the time taken by minced cooked beef to putrefy in presence of solutions of silver compounds of known strength; (2) by inoculating an agar medium containing a definite quantity of the various silver compounds. Neither method can be regarded as wholly satisfactory. In the case of the beef experiments it was several times observed that a certain strength of solution prevented putrefaction better than one double the strength. The experiments, however, on the whole corroborate those previously described, and, consequently, we think they are worthy of record.

One gram of finely-minced lean roast beef was placed in test tubes, each of which contained an aqueous solution of the silver compounds of known strength. The test tubes were then placed in an incubator at 40° C., and observations were made every morning to detect any smell of putrescence. The days given are those on which a smell of putrescence was first observed. In the case of the control this was on the first day.

SILVER NITRATE.			
0.001 per cent. Ag	...	...	3rd day
0.002 " " "	...	...	5th "
0.004 " " "	...	...	8th "

ACTOL.			
0.001 per cent. Ag	...	...	3rd day
0.002 " " "	...	...	4th "
0.004 " " "	...	...	6th "

ARGENTAMINE.			
0.001 per cent. Ag	...	...	3rd day
0.002 " " "	...	...	5th "
0.004 " " "	...	...	6th "

PROTARGOL.			
0.001 per cent. Ag	...	...	5th day.
0.002 " " "	...	...	4th "
0.004 " " "	...	...	6th "

LARGIN.			
0.001 per cent. Ag	...	...	4th day.
0.002 " " "	...	...	5th "
0.004 " " "	...	...	5th "

ICHTHARGAN.			
0.001 per cent. Ag	...	...	4th day.
0.002 " " "	...	...	4th "
0.004 " " "	...	...	7th "

ALBARGIN.			
0.001 per cent. Ag	...	...	3rd day.
0.002 " " "	...	...	4th "
0.004 " " "	...	...	6th "

NARGOL.			
0.001 per cent. Ag	...	...	5th day.
0.002 " " "	...	...	5th "
0.004 " " "	...	...	6th "

ARGYROL.			
0.05 per cent. Ag	...	...	6th day.
0.2 " " "	...	...	6th "
1.0 " " "	...	...	6th "

COLLARGOL.			
0.01 per cent. Ag	...	...	5th day.
0.05 " " "	...	...	4th "
0.1 " " "	...	...	6th "
0.5 " " "	...	...	6th "

In the second class of experiments agar medium containing a definite quantity of the respective silver compounds was sloped and inoculated in the form of a streak culture with *Staphylococcus pyogenes aureus*. The tubes were then incubated at 38° C. The following results were obtained (+ indicates growth on first day):

SILVER NITRATE.			
0.002 per cent. Ag	...	...	0
0.001 " " "	...	...	+

SILVER FLUORIDE, PROTARGOL, LARGIN, ICHTHARGAN, ALBARGIN, and NARGOL gave the same results.

ARGENTAMINE.			
0.004 per cent. Ag	...	...	0
0.002 " " "	...	...	+(2nd day).
0.001 " " "	...	...	+

ARGYROL.			
0.05 per cent. Ag	...	...	+

COLLARGOL.			
0.01 per cent. Ag	...	...	+

DIFFUSION EXPERIMENTS.

As the therapeutic value of bactericidal substances employed in the class of cases for which silver compounds are commonly recommended does not depend on their bactericidal action alone, but also in some degree upon their power of diffusion, their freedom from ill-effects, etc., an endeavour was made to determine the relative rates of diffusion, this being the only other factor that cannot be definitely decided by clinical observation. The method employed was as follows: Glass tubes, 50 mm. long and of 2 mm. bore, were filled with 2 or 3 per cent. nutrient agar,

which had previously been inoculated with *Staphylococcus pyogenes aureus*. The tubes were placed horizontally in solutions of the various silver compounds corresponding to 0.5 per cent. Ag. After remaining twenty-four hours, they were taken out, washed in water, and any diffusion apparent to the eye, either as a precipitate or a coloration, measured. The agar cylinders were then blown out of the tubes, well washed in a stream of sterile water, placed in Petri's dishes and incubated. The experiments, for reasons we have not yet been able to determine, were not uniformly successful; in some cases no growth occurred in the agar cylinder. The following table is a record of successful experiments. "Free" indicates the length of cylinder in millimetres free from bacterial growth at the respective ends; "growth" indicates the length of cylinder showing bacterial colonies.

	Free.	Growth.	Free.
Silver nitrate (0.5 per cent. Ag)	13.0	24	13.0
Silver fluoride " "	13.0	24	13.0
Argentamine " "	15.5	19	15.5
Protargol " "	19.0	24	7.0
Albargin " "	17.0	17	16.0
Ichthargan " "	16.0	19	15.0
Largin (0.25 per cent. Ag)	9.5	31	9.5
Argyrol (10 " ")	20.5	9	20.5
Control ...	0.0	50	0.0

The obvious diffusion, as shown by the formation of a precipitate in, or, in the case of coloured substances, by discoloration of the agar cylinder, is seen in the following table:

	Obvious Diffusion from Each End of Tube.	
Silver nitrate (0.5 per cent. Ag)...	8.0 mm.	8.0 mm.
Silver fluoride " "	8.0 mm.	8.0 mm.
Actol " "	8.0 mm.	8.0 mm.
Albargin " "	8.0 mm.	8.0 mm.
Ichthargan " "	7.2 mm.	7.2 mm.
(slight opalescence to 10 mm. on each side).		
Argentamine " "	5.0 mm.	5.0 mm.
Protargol " "	10.0 mm.	4.0 mm.
(precipitate of 2.0 mm. on each side).		
Novargan " "	8.0 mm.	5.0 mm.
(precipitate of 2.0 mm. on each side).		
Nargol " "	7.0 mm.	4.5 mm.
(precipitate of 0.8 mm. on each side).		
Largin (0.25 per cent. Ag)...	5.0 mm.	3.0 mm.
(precipitate of 1.5 mm. on each side).		
Argyrol (5 per cent. Ag) ...	4.0 mm.	4.0 mm.
" (10 per cent. Ag) ...	13.0 mm.	13.0 mm.
Collargol (5 per cent. Ag) ...	2.5 mm.	2.5 mm.
" (10 per cent. Ag) ...	8.0 mm.	8.0 mm.

The different diffusions observed at different ends of the tubes in some cases is probably due in part to the tubes not having lain quite horizontally owing to inequalities in the bottom of the dish in which they were placed.

We do not presume to state that these relative rates of diffusion will be maintained in the case of living cells, as it is known that the rate of diffusion into agar jelly and the rate of absorption into living cells are in the case of some salts markedly different, but we do believe that these experiments are suggestive as regards the rate of absorption.

SUMMARY.

The experiments show that as regards bactericidal action the various silver compounds investigated fall into three groups: (1) Those which are powerfully bactericidal; (2) one—nargol—much less powerfully bactericidal; (3) two—argyrol and collargol—which possess practically no bactericidal action whatever. The first group includes most of the substances investigated, namely, silver nitrate, silver fluoride, actol, itrol, argentamine, argentol, albargin, argonin, ichthargan, largin, novargan, and protargol. The bactericidal action of these in solutions con-

taining the same percentage of combined silver is closely similar, and it is practically impossible to place them in any order of activity which would be true under all circumstances.

As argyrol and collargol are not bactericidal, it is evident that the amount of silver which a compound may contain is no criterion of its bactericidal power. Moreover, in view of the results obtained with argyrol, it seems impossible to attribute the good effects which many clinicians have obtained with it to its bactericidal action.

THE RELATION BETWEEN A CUTANEOUS NAEVUS AND A SEGMENTAL NERVE AREA.

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THE original observation which pointed out the fact that naevi sometimes occupy nerve areas I have failed to trace. But it is mentioned in some of the textbooks which deal with the matter, and in a few an example is illustrated. The illustrations are those which relate to the areas of the fifth cranial nerve; and I cannot discover any recorded case which describes the distribution of a naevus that corresponds to the area of a segmental nerve.

Fig. 1.

For such a case I have been looking for four years, and at last I have found one among the out-patients of King's College Hospital. It is the first case of naevus which I have seen or heard of which corresponds to the complete area of distribution of one segmental nerve area.

This naevus occupies the area of distribution of the third cervical nerve. (See Figs. 1 and 2.) Fig. 3, with Dr. Head's kind permission, is taken from his article in *Brain*, vol. xvii, on The Disturbances of Sensation with Especial Reference to the Pain of Visceral Disease, and shows the corresponding part mapped out in the sterno-mastoid area, which is the area of the third cervical nerve. The curious notch in the lower border of the naevus corresponds to the same interruption in the line of the inferior border to the sterno-mastoid area. In my case the actual naevus is difficult to reproduce in a photograph, but clinically it is linear and less continuous in arrangement towards the angle of the jaw where the lines are vertical. In fact the whole manner of its formation resembles an eruption of herpes zoster in this area.

In my collection I have naevi which occupy the following areas:

1. The first division of the fifth cranial nerve.
2. The second division of the fifth cranial nerve.
3. The first and second divisions of the fifth cranial nerve.
4. Dr. A. H. Lister of Aberdeen has kindly sent me a cutaneous and subcutaneous naevus which occupies the areas of the fifth cranial nerve, the second cervical nerve, and part of the third cervical nerve. But the case I now publish is the first and only one that corresponds to a

Fig. 2.

single segmental nerve distribution. It is not one case out of many, but the only case of a widespread naevus I have seen on the neck or trunk.

I have published three cases of rodent ulcer which are of interest in considering the areas occupied by naevi.

1. Occupied the area of the first division of the fifth cranial nerve (BRITISH MEDICAL JOURNAL, April 18th, 1903, which also contained the next case).
2. Occupied the second division of the fifth cranial nerve.
3. Occupied the first and second divisions of the fifth cranial nerve (BRITISH MEDICAL JOURNAL, December 12th, 1903).

Fig. 3.

So far as the head is concerned, these rodent ulcers correspond in distributions to the naevi and eruptions of herpes on the face; but on the body I have never seen any case of widespread rodent ulcer which marked out a segmented nerve area, and in this respect the distribution