Chart III) carried a pneumococcus during the entire investigation in spite of treatment with sulphathiazole (33.3%) snuff and sulphathiazole - sulphapyridine snuff. He was known to be a chronic pneumococcus carrier, Type III and other pneumococci having been isolated from throat and nose on many occasions over several years. Most of the swabs obtained during the present experiment grew Type III pneumococci, but sometimes a mixed growth of Type III and other pneumococci was obtained.

Two further subjects began to carry a pneumococcus while taking sulphathiazole (33.3%) snuff, and each continued to carry the organism for two weeks. Another subject began to carry a pneumococcus in the autumn of 1940, in the third week of a cold, while taking 5% proflavine snuff. He was later treated with sulphathiazole (33.3%) and sulphathiazole - sulphapyridine snuffs for thirteen consecutive weeks, but never lost the pneumococcus. The pneumococci isolated from these carriers were sensitive to sulphathiazole and sulphapyridine *in vitro*, which makes the failure of the snuffs to affect the carriage of this organism difficult to explain. It is possible that this organism tends mainly to colonize the sinuses and sinus cells and other inaccessible nooks and crannies in the nasal cavity.

Results with Other Organisms

Meningococci.—These organisms are not commonly isolated from the nose, and in this investigation the chance of obtaining a culture of meningococcus was small, because the swabs were emulsified in heart broth and the broth was then used to inoculate plates. Meningococci in heart broth may die in a few minutes. In spite of this, meningococci were isolated during January and early February from four subjects who were taking plain magnesium carbonate snuff. From one subject the organism was obtained only once, but from the other three it was obtained on three or four occasions during two weeks. After this each carrier started a course of sulphathiazole (33.3%) snuff, and the meningococci disappeared and were not seen again during the remaining weeks of this investigation, even during snuff-free intervals.

Haemolytic Streptococci.—One subject carried a haemolytic streptococcus (Group A, Type 5) in his right nostril only. It was grown from 19 out of 25 swabs during a period of ten weeks and did not disappear with sulphathiazole (10%) snuff treatment. Afterwards the carrier was treated with sulphathiazole (33.3% snuff) for seven weeks and then with sulphathiazole - sulphapyridine snuff. During the first three weeks of this treatment there were four positive swabs each yielding only one or two colonies. The organism then disappeared, and had not returned four weeks after cessation of treatment.

Neisseria catarrhalis.—There were five carriers of a Gram-negative coccus which did not ferment dextrose, maltose, or sucrose, and had dull grey-yellow colonies which could be easily pushed over the surface of the plate with a wire loop. Only one subject lost this organism when taking sulphathiazole (10%) snuff, and with him it never reappeared. Three others lost it during treatment with sulphathiazole (33.3%) snuff: with one of them it reappeared four weeks after stopping snuff. The fifth subject did not lose the coccus till treated with sulphathiazole - sulphapyridine, and it returned two weeks after stopping snuff.

Proteus vulgaris.—There was one carrier of this organism. Four swabs were all positive when he was first examined. It appeared less often under treatment with sulphathiazole (33.3%) snuff, and was grown from only one of eleven swabs during treatment with sulphathiazole - sulphapyridine snuff. After stopping snuff three out of seven swabs were positive. *In vitro*, *P. vulgaris* was only slightly sensitive to sulphathiazole even in saturated solution.

Antiseptic Snuffs in Relation to Colds

There is now further evidence from a number of people that the snuffs, if taken within two days after the onset of a cold, shorten the course of the disease. The discharge usually remains clear and the purulent stage is either prevented or lessened in intensity. There is no evidence that the snuff prevents colds.

Oral Insufflation of Antiseptic Powders

Three individuals were treated by the oral insufflation of sulphathiazole (33.3%) in magnesium carbonate. The

tonsils and visible part of the nasopharynx were thickly coated with the powder three times a day on five days a week, from Monday to Friday. No evidence was obtained, from swabs taken on Tuesday to Thursday inclusive, of any alteration in the type or numbers of organisms present.

Summary

An antiseptic snuff containing sulphathiazole is effective in causing an extreme reduction in the number of staphylococci in nasal carriers of this organism. The carriers are not cured, as the organisms reappear within a few weeks of the cessation of treatment.

It is effective in the cure of carriers of Hoffmann's bacillus and is likely to prove effective in the treatment of chronic nasal diphtheria carriers.

It may be effective in the treatment of nasal haemolytic streptococcus carriers.

It may be of value in the treatment of carriers of meningococci.

It is worth further trial in cases of the common cold, in which it tends to affect the course of the disease favourably although it is not a preventive.

There is no evidence that it affects the nasal carriage of pneumococci.

We wish to express our thanks to all those who have submitted themselves to repeated swabbings and snuff treatment over many months. We are also greatly indebted to Messrs. May and Baker, Ltd., for their generous help in supplying us with the sulphathiazole and sulphapyridine used in this and the earlier investigation.

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JUGULAR THROMBOSIS AFTER TONSILLITIS

BY

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Three cases of jugular thrombosis have been treated. A description of the condition is best given in the details of their clinical history.

Case I

A man aged 21 was admitted to hospital on November 8, 1934. Two weeks before admission he had had a quinsy without pus formation, and swelling below the left mastoid. The temperature was 104°. This responded to local antiseptic treatment. Then just before admission he complained of pain behind the right mastoid process, but no pain in the ear or deafness. There was some thickening over the area of the mastoid emissary vein. The temperature was normal. The tympanic membrane was congested but translucent. Paracentesis was performed and about two drops of serous exudate was obtained. The patient looked so ill, and his temperature had been so high with his throat condition, that a cortical mastoid operation was performed. The mastoid cells were practically normal except for some congestion, and no pus was obtained. The lateral sinus plate was so posteriorly placed that the sinus was not exposed. After a swinging temperature for five days the clean mastoid wound was reopened and a lateral sinus full of pus exposed. This was opened and the outer wall cut away. Bleeding was secured from the torcular but not from the jugular end. Packs were inserted, being removed after five days. Before the operation both optic disks showed about three dioptries of optic neuritis. The whole condition cleared up, apart from an attack of German measles, one month after the first operation.

A blood investigation showed 75% haemoglobin, and ferrous iron was administered in large doses. There had been no swelling in the neck at the time of the lateral sinus operation,

and a jugular operation was not thought necessary. The small amount of serous exudate in the middle ear was thought to be due to the proximity of an infected jugular bulb, and the lateral sinus infection was obviously of too long duration to be put down to the mastoid operation.

Case II

A woman aged 34 was admitted on April 4, 1940, with a lateral pharyngeal abscess below the tonsil at the level of the epiglottis. She had had pain for a week, and for three days acute difficulty in swallowing, with three rigors. Her temperature was 103° when first seen. She was five months pregnant. There was a hard brawny swelling from the left mastoid to the sterno-clavicular joint, the breath was very foul, and there was some respiratory distress. Swelling was present in the submental region.

Under local anaesthesia the left jugular vein was opened and about 30 c.cm. of foul pus obtained. The vein was packed with a thin gauze strip and the wound left open, with the vein edges sutured to the skin. The patient's condition improved, but two days after admission swallowing was almost impossible, and she regurgitated all fluids. Under local anaesthesia the inner wall of the previous incision was cut, and dissection carried through fibrosed tissue to the inner side of the carotid sheath. This was retracted laterally and the thyroid gland medially, and 20 c.cm. of foul pus obtained from a large abscess against the lateral pharyngeal wall. A tube drain was inserted. Her condition again improved, but the submental region became swollen and the floor of the mouth was raised.

Under local anaesthesia an incision was made from the chin to the hyoid bone and pus was obtained from an abscess extending laterally in both submaxillary regions to the angles of the jaw and down to the geniohyoids. The patient's general condition improved and temperature continued at a level of 99°. There were no further changes in the local condition and the whole neck remained brawny. However, three days after the last operation her temperature suddenly rose to 102° and pulse to 160, and the patient died in a cyanotic condition on April 10.

At necropsy the left side of the neck was hard and indurated, with small localized abscesses scattered throughout the muscles. The jugular vein showed thrombosis just below the opening above the junction with the subclavian. There was also a thrombosis in the lateral sinus on the left side. The cavernous sinus was normal.

Besides having the abscess opened, she had been given a large amount of sulphapyridine (intramuscularly when she could not swallow the tablets). The pus from the internal jugular vein showed numerous Gram-negative bacilli and diplococci, and a fair number of Vincent's organisms. On culture *Staphylococcus aureus* was grown. Her haemoglobin never fell below 85% and the leucocytosis varied between 26,000 and 22,000 per c.mm. In this case a more extensive operation should have been done at first—opening of the jugular, extension down the lateral wall of the pharynx, and dissection deep to the submaxillary gland.

Case III

A woman aged 54 was admitted on March 6, 1940, with a history of sore throat for one week, a temperature of 104°, a quinsy on the left side, and a large brawny swelling on that part of the neck. With local treatment and sulphapyridine the condition in the throat cleared up and the temperature was normal in two days. There was still some swelling below the left mastoid, and the patient's temperature was reduced to 101°. At this time her haemoglobin was down to 55% and red cells to 3,000,000; leucocytes were 21,000 per c.mm. On March 19 her temperature rose to 106°; a blood culture was negative, but next day the left internal jugular was opened low down in the neck and pus containing pneumococci and streptococci was evacuated.

The patient's condition now showed some improvement, but she tended to have breathless attacks at times. The pharynx and larynx appeared normal, but on examination of the chest crepitations were found at the right base and radiographs revealed some dimness of the lower half of the right lung. Three blood transfusions were given at weekly intervals. The sulphapyridine was stopped and sulphanilamide was given in regular doses over three weeks. The pulse rate showed a steady

rise and the respiration rate at times was over 40. On April 14 the jugular vein was opened up to the mastoid process and down to the sterno-clavicular joint. Blood clot was obtained but no pus. There had been some question of the thrombosis spreading to the subclavian vein, but the condition of the patient was too bad to warrant operation on this or to expose the lateral sinus.

However, on April 17 symptoms of cavernous sinus thrombosis appeared and the patient died next day. A few hours before death she coughed up 3 oz. of bright blood. As a necropsy was not allowed the source of this could not be ascertained, but was probably the right lung. This loss of blood was not of much consequence, as two days previously her haemoglobin was up to 92%.

Summary of Literature

Several writers have reported cases of this condition, but a description of it seems to have evaded the textbooks. Most of the articles were in the American literature, but van Gilse and Benjamins, in personal communications, have described cases to me. On the Continent drainage of the internal jugular vein has apparently been sufficient, but some of the American surgeons have found it necessary to open and drain both the internal jugular and the lateral sinus. This, I think, should have been done in my last two cases, but of course the second patient was too ill to withstand any further surgical endeavour.

The cases recorded in the United States certainly give better results than mine. Stone and Berger (1936) report two of their own with recovery, two of Eagleton's, and one of Kerman's. Out of five there were three recoveries, in each of which cases the neck and lateral sinus were operated on. Porter (1937), in reporting his case, is also of the opinion that this should be done. Gilmore's case (1939) recovered after only the jugular operation. Beck (1934) seems to favour this, but he had one case in which the lateral sinus was opened because of mastoiditis. Nussbaum (1929) collected 58 cases with 23 recoveries up to 1927, so it may be seen from the literature that the condition carries a high mortality.

Discussion of Treatment

Points in the treatment may be summarized as follows:

1. The operative treatment must not be delayed until a positive blood culture is obtained. Rigors may not occur; sometimes there are feelings of chill.

2. If the external swelling does not begin to subside one day after satisfactory incision of an abscess in the pharynx external operation is necessary.

3. If the condition of the patient does not improve after the internal jugular is opened, drainage of the lateral sinus should be performed. Only about four days should be allowed for this improvement.

4. As regards the sulphonamide group, the last two cases had large amounts of sulphapyridine before operation, and it was noticed that any abscesses found were walled off by strong fibrous-tissue capsules, which made the dissection in the neck very difficult. Also the pus in these abscesses seemed to be thick and semi-organized by fibrin deposits. At necropsy the second case showed muscles and neck contents bound together with small abscesses scattered in the hard fibrous mass almost like actinomycosis. It seemed to me, therefore, that it would be more reasonable in a case that was likely to require opening of abscesses in the neck, especially abscesses among muscles and fasciae, to retard the administration of these drugs until the abscesses could be opened, and opened widely. As Beck (1932) states: "In cervical fascia infections drainage placed in advance of involvement is better than drainage which only trails the involvement." From consideration of these two cases it is my impression that pre-operative treatment by the sulphon-

amide group causes so much scarring and deposit of fibrous tissue that it hinders efficient drainage. This may be said to be a sweeping statement when founded on two cases, but a similar condition can be seen in cases of mastoid abscess that have had large doses of these drugs. Therefore in future cases of deep neck infection I should operate first and then use the sulphonamide group in large doses by mouth, parenterally, or by packing the wound, with the proviso that my operative drainage should be extensive and that it entirely covered any region likely to be infected.

5. The direction of spread of the infection and places that should be inspected for possible infection need not be gone into here. Mosher (1929) has described these matters in detail. It is as well to complete the drainage of the neck region in the one operation, as a second attack may have to be done with landmarks lost in fibrous tissue and difficult to find.

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ECONOMY IN THE TREATMENT OF IMPETIGO AND SCABIES

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The experience of twenty months of wartime dermatology has shown that impetigo and scabies are by far the commonest and most troublesome of skin conditions occurring in the Navy. It has also been observed that before admission cases have been subjected to various forms of treatment. This, it is felt, lengthens the duration of these conditions and is uneconomical. Rapidity of cure and economy in drugs are essential in wartime practice.

The Therapeutic Requirements Committee of the Medical Research Council (1940) classified the drugs employed in dermatological practice and stated:

1. For many of the purposes for which ointments are often prescribed pastes and creams are more satisfactory and require only about half the amount of fatty basis.

2. The amount of mercury used could be greatly reduced, and it need only be available for trial in cases in which alternative antiseptics have not proved satisfactory.

3. A large number of chemical substances will destroy the acarus, and all local treatments depend largely on the efficiency of application. Sulphur ointment still remains one of the most efficacious remedies, and the frequency of sulphur dermatitis has been overstated. If supplies of benzyl benzoate are short this substance would be best reserved for treatment of children.

In view of the above findings, and in the hope that a greater uniformity in the methods of treating impetigo and scabies would result both in a quicker turnover of cases and in economy, the following suggestions are given. More uniformity of treatment would be of value in the Services, where one medical officer so rarely sees a case from onset to complete cure.

Impetigo

Opinions differ as to the most satisfactory treatment of impetigo. Andrews (1938) advises 5% ammoniated mer-

cury ointment, and this would appear to be the treatment most commonly used. Forman (1938) advocates a lotion with copper and zinc sulphate (eau d'Alibour). Roxburgh (1941) prefers a paste or cream with 2% ammoniated mercury incorporated, and also mentions the occlusive treatment with elastoplast. He states that powdered sulphanilamide has been used, but that no figures are as yet forthcoming. Many other antiseptics have also been used, generally in aqueous solutions.

As a result of the study of 74 cases of impetigo contagiosa in hospital during 1940 and the early part of 1941, a technique was devised which on the whole gave satisfaction. The procedure was softening of the crusts with a sulphanilamide ointment (see 1 below), which took approximately forty-eight hours. The areas were then found to be clean and to be oozing serum. A paste consisting of 2% ammoniated mercury in zinc paste was next applied twice a day with only superficial cleaning before reapplication. No attempt was made to remove the adherent paste over the denuded areas. After the paste had been in use for five days it was removed completely with olive oil and the lesions were examined. Any areas still showing evidence of irritation or a tendency to exude serum then received paste for a further seven days. When all lesions were dry and healing eau d'Alibour was applied to the area night and morning for one to two weeks.

Recently it was decided to replace the mercury in the paste by one of the aniline dyes. By this means it was hoped to bring about an improvement in treatment and to save mercury. Brilliant green was chosen as the dyestuff for two reasons. In the first place, brilliant green is bactericidal to *Staph. aureus* in a dilution of 1 in 4,000,000. Secondly, the stearate of brilliant green is fat-soluble and can be incorporated in a paste. Brilliant-green stearate was therefore made up in zinc paste in a strength of 1% (see 2 below). A small number of cases have now been treated with brilliant-green stearate paste, and the results so far achieved have been highly satisfactory.

TABLE I.—Brilliant-green Stearate Paste in Impetigo

Case No.	Organism	Days on			Days Ill
		Sulphanilamide Ointment	Brilliant-green Paste	Eau d'Alibour	
1	<i>Staph. aureus</i>	2	5	—	7
2	Not cultured	4	10	—	14
3	<i>Staph. aureus</i>	2	7	—	9
4	" "	2	5	7	14
5	" "	2	5	7	14
6	" "	2	12	7	21
7	" "	2	12	7	21
8	" "	2	12	7	21
9	" "	2	12	7	21

1. The sulphanilamide ointment is prepared as follows: Sulphanilamide, 5 parts, and glycerin, 30 parts, are dissolved with the aid of gentle heat. Adeps lanae anhyd., 32.5 parts, and paraff. molle flav., 32.5 parts, are then heated gently to melt and incorporated with the sulphanilamide solution. The preparation is stirred until cold.

2. Brilliant-green stearate may be prepared by adding excess potassium hydroxide to a solution of brilliant green B.P.C. (sulphate) in water. The resultant precipitate is collected, washed, and heated with an equal weight of stearic acid. The paste is prepared as follows: Brilliant-green stearate, 1 part, and ung. simplex, 50 parts, are heated to liquefy, and are incorporated with zinc oxide, 25 parts, and amylum pulv., 25 parts, the whole being stirred until cold.

Scabies

Much has recently been written on the treatment of scabies and many remedies have been advocated. This, among other facts, adds to the difficulty of one who has to treat unsuccessful cases when notes on previous treatment are not forthcoming. Approximately 50% of the cases