FOUR SERIES OF CASES OF SEWER-GAS POISONING.

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THE various diseases of a septic nature which may be produced by sewer-gas poisoning are well exemplified by four series of cases which have occurred in my practice during the last seven years.

FIRST SERIES.

In December, 1891, a lady was confined and attended by Mr. Kinsey at Bedford. The labour was quite normal, but was followed by pelvic cellulitis. When I joined Mr. Kinsey at the end of January, 1892, there was a large mass in the left iliac region of this patient. This gradually disappeared during the next two months, and the patient entirely recovered.

Between the end of January, 1892, and August of the same year, there occurred in this house the following cases:

Acute rheumatism	...	...	...	...	2 cases.
Diphtheria	...	...	...	...	1 case.
Follicular tonsillitis	...	...	...	...	2 cases.
Otitis media	...	...	...	...	2 cases.

making, with the case of pelvic cellulitis, altogether 8 cases which might have been caused by sewer gas.

The cases of rheumatism were cases of acute arthritis, that is, there was inflammation of certain joints of a nature which could not be distinguished from acute rheumatism. The case of diphtheria was a severe membranous tonsillitis, which could not clinically be distinguished from diphtheria, but, as the membrane was not examined bacteriologically, it is not certain that it was true diphtheria.

One of the ear cases was most interesting. It occurred in a boy aged 12, who had had otorrhœa for five years. After a box on the ear he suddenly developed signs of acute meningitis. The mastoid cells and antrum, the middle fossa of the skull, and the lateral sinus were explored without obtaining anything very definite of a septic nature. Double disseminated pleuro-pneumonia followed of a most serious nature. After a desperate illness of three months' duration the boy recovered. During this long illness I repeatedly asked to have the drains examined, but could not get it done. At last the drains overflowed, and it was found that the Buchan trap was full of sewage and the drain behind it completely choked. Sewage had also regurgitated into the soft water tank. The block in the drain must have existed a very long while.

SECOND SERIES.

The second series occurred in 1893, in a family who lived in a crowded and dirty cottage. Exactly opposite the house was a drain ventilator in the middle of the road. The children were constantly playing over this and sitting on the doorstep within a few feet of it. There were 5 cases of illness within four months.

CASE I occurred on May 24th, 1893. A girl of 13 developed acute lobar pneumonia. She was removed to hospital, and recovered.

CASES II and III.—On June 27th a girl aged 11 and a boy aged 3 developed severe follicular tonsillitis, from which they recovered.

CASE IV.—On July 18th a boy aged 6 developed acute nephritis. He was removed at once to the hospital, and recovered.

CASE V.—In August a baby of 7 months had a severe attack of gastro-enteritis, and recovered.

After this, acting on my advice, the family moved to another house, where, although they have retained their dirty habits, they have never had any serious illness beyond occasional attacks of diarrhœa and influenza.

I believe all these five cases had a common cause, which most probably was sewer gas from the drain ventilator.

THIRD SERIES.

The third series of cases occurred in 1898.

CASES I and II.—Two boys developed measles on March 9th. One of them, N. P., developed otitis media; the other, H. P., developed bronchitis. On March 26th, when they were nearly well, N. P., who had otorrhœa, scratched a pimple on his forehead and developed erysipelas. His temperature was 105.2° that evening. Next day it was nearly normal. The same day H. P. developed follicular tonsillitis, which lasted a week.

CASE III.—Their aunt, G. H., who was looking after them, had a cracked thumb, and on March 28th felt a pain in it. I saw her twelve hours later, and at once incised the thumb down to the bone. The incision was not felt, neither did it bleed, showing the intensity of the inflammation, which in twelve hours had destroyed the life of these soft tissues. Cellulitis spread over the front of the wrist and lymphangitis up the arm to the axilla, where the glands became enlarged and tender. Two incisions were made over the front of the wrist down to the tendons, but no pus was found. There was very high fever—104°. Eight injections of 10 c.cm. of antistreptococcus serum obtained from Mr. Bokenham were given, two on April 6th, three on April 7th, two on April 8th, and one on April 9th. After these the temperature fell for a time. Cultures from the original wound in the thumb showed streptococci and staphylococci. There was no sign of suppuration until April 13th, when an abscess was opened on the front of the wrist. On April 15th an abscess was opened over the right sacro-iliac joint and another under the right pectorals, which pointed anteriorly. On April 20th an abscess under the muscles attaching the right scapula to the spine was opened, and a small superficial abscess at the seat of one of the serum injections. On April 23rd another abscess over the wrist was opened, and lastly, on May 13th, a counter-opening was made in the right axilla to drain the subpectoral abscess. On May 16th the temperature fell to normal, and has not risen again. There were never any internal complications.

CASE IV.—On April 12th, D. P., a sister of the boys, developed acute otitis media, and on April 15th, N. H., a sister of the aunt, who had come to help with the nursing, also developed follicular tonsillitis. The deposit from her throat was examined by Dr. S. J. Ross, who cultivated both a streptococcus and staphylococcus pyogenes aureus from it. On May 14th—two days after getting wet—this patient developed acute synovitis of the left knee and swelling over the left ankle, apparently rheumatic. This quickly subsided with rest and salicylate of sodium. The drains were examined and two escapes of sewer gas found. The water-closet was foul and the house was not in a clean state owing to the presence of several dogs.

FOURTH SERIES.

This series occurred since I recorded the previous series in a paper read before the South Midland Branch of the British Medical Association at the meeting held at Wellingborough on October 6th, 1898.

CASE I.—On October 16th, 1898, I saw a maidservant with subacute arthritis of knees and ankles, which I attributed to rheumatism. A few days later she developed a sore throat.

CASE II.—On October 30th I saw a girl, aged 8, suffering from double otorrhœa and acute inflammation of the mastoid antrum. Three or four days previously she had symptoms of influenza, and to this I attributed the ear complications.

CASES III and IV.—During the following week two other children—a boy aged 7 and a girl aged 10—had sore throats, which were also put down to influenza. I did not see them.

CASE V.—On November 9th I saw a child of 18 months with a severe herpetic eruption on the chin and under the jaw. The child objected to being moved, and a small boil was found on the outer side of the left thigh. This was fomented, but a large abscess formed beneath the subcutaneous fat, and was opened on November 13th.

CASE VI.—On November 16th the mother of these children developed a membranous tonsillitis.

CASE VII.—On November 21st the trained nurse in attendance developed symptoms of influenza. She was removed from the house at once, and on November 23rd had well-marked follicular tonsillitis.

At first I attributed these cases to influenza, but when the baby developed an abscess, streptococcus poisoning from drains was suspected. The drains were examined, and as many as seven escapes were found. The baby's abscess would appear to have been caused by washing in soft water obtained from a tank into which sewer gas freely escaped. It is possible that there may have been a combination of influenza and sewer gas in this series of cases.

REMARKS.

In these four houses the following diseases were apparently caused by exposure to sewer gas :

1. Pelvic cellulitis, 1 case.
2. Diphtheria (?), 1 case, not tested bacteriologically.
3. Follicular tonsillitis, 10 cases.
4. Otitis media, 5 cases.
5. Erysipelas, 1 case.
6. Pleuro-pneumonia, 1 case.
7. Lobar pneumonia, 1 case.
8. Poisoned thumb and septicæmia, 1 case.
9. Acute arthritis—rheumatism, 4 cases.
10. Acute nephritis, 1 case.
11. Gastro-enteritis, 1 case.
12. Abscess, 1 case.

1. *Pelvic cellulitis* is well known to arise from septic infection and every obstetrician knows the danger of confinements in badly drained houses.

2, 3. *Septic throats* are the commonest of all diseases due to sewer-gas. At one time I knew a boarding-house where follicular tonsillitis was constantly occurring in one of the dormitories, and most of the boys had chronic enlargement of the tonsils. An addition of 6 feet to a ventilating pipe near the window of this dormitory has entirely got rid of the occurrence of tonsillitis in this house.

4. *Otitis media* occurs as a sequela of tonsillitis and pharyngitis caused by sewer gas.

5. *Erysipelas* can be caused by the germs which are the septic agents in sewer gas, and in the case related these no doubt gained entrance through an abraded pimple.

6. *Pleuro-pneumonia*.—The case of pleuro-pneumonia appeared to be caused by the otorrhœa becoming septic from the introduction of sewer gas. In the absence of thrombosis of the lateral sinus it was thought that probably there was septic thrombosis of the petrosal sinuses. The scattered character of the pneumonia seemed to indicate an embolic origin.

8. *Septicæmia*.—This case was caused by the introduction of streptococci and staphylococci, which were obtained apparently from the case of erysipelas. It appears that the poison which in one person produces erysipelas, in another will produce septicæmia, and in another ordinary suppuration. This patient, G. H., for several days after infection seemed quite unable to produce pus; no pus formed until after the serum injections, and when the local abscesses did occur the dangerous symptoms subsided.

9. *Acute Arthritis or Rheumatism*.—Rheumatism appears to be a disease of doubtful origin. According to Fagge, the only well-recognised cause is getting wet or exposure to wet weather. The name has been applied to the cases of acute synovitis which follow scarlet fever, and also to those caused by the presence of the gonococcus in the joints. I have often thought that many of the cases of acute arthritis which go by the name of acute rheumatism are in reality cases of septic infection. It is possible that acute rheumatism is produced by the entrance of some germ into the body, which either gains entrance into the joints and there sets up a local inflammation, or which grows elsewhere—for example, in the tonsils and pharynx, and produces a toxin which causes the joint affection. The exposure to wet and cold may be merely the determining cause, as it so often is in an attack of influenza. One cannot help being struck by the similarity of the symptoms of acute rheumatism and septicæmia. In both we may get sore throat, fever, sweating, inflammation of joints, heart, veins, lungs, and serous membranes.

Dr. Newsholme, in his Milroy Lectures at the Royal College of Physicians in 1895,¹ on the Natural History and Affinities of Rheumatic Fever, stated that "Rheumatism is a specific febrile disease caused by the introduction from without and multiplication in the system of a pathogenic micro-organism." "With regard to the nature of the infecting micro-organism the evidence at present is incomplete and unsatisfactory." He stated that according to Dr. J. K. Fowler, "sore throat preceded 80 per cent. of the cases of rheumatic fever." If the infecting organism of rheumatism gains entrance through the tonsils and pharynx, it is exactly what happens in scarlet fever, which often is complicated with rheumatic symptoms.

As regards the incubation of acute rheumatism, Dr. Newsholme could not fix a period. The case of N. H., related above, may throw some light on this. The interval between the attacks of follicular tonsillitis and synovitis was 28 days. The onset of the synovitis, however, may have been deter-

mined by getting wet. Observations on the time of occurrence of rheumatism after the throat affection in scarlet fever may throw some light on this subject.

10. *Nephritis*.—In the BRITISH MEDICAL JOURNAL for 1888 Sir G. Johnson recorded several cases of albuminuria due to sewer gas poisoning.

11. *Gastro-enteritis* is often caused by streptococci, which appear to be the active agents in sewer gas.

REFERENCE.

¹ *Lancet*, vol. 1, pp. 589 and 657.

ON THE ACTION OF SOME ESSENTIAL OILS AND OTHER VOLATILE SUBSTANCES ON THE GROWTH OF THE BACILLUS TUBERCULOSIS AND IN THE TREATMENT OF PHTHISIS.*

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For some time past there has been a pretty general belief that certain essential oils when inhaled have the power of retarding the growth of the bacillus tuberculosis. The literature of the subject, although fairly copious, is inconclusive. As it seemed desirable to arrive at some definite result certain experiments were made, partly clinical and partly bacteriological. The two series were carried out simultaneously, and were spread over a period of about two years.

There are many essential oils, and two of them were selected as being typical of the group, the oil of cinnamon and the oil of peppermint.

All essential oils—from the high price they command—are liable to adulteration, but care was taken to obtain pure and reliable specimens. The services of an expert in this department were procured, and he selected two samples which he considered to be above suspicion.

The clinical observations were carried out on twenty patients suffering from phthisis, none of whom were confined to bed. Some were quite in an early stage, and some had cavities in either one or both lungs. In some cases the patients were made to inhale once or twice a day air impregnated with either oil of cinnamon or oil of peppermint, whilst in other cases the patient was given a supply of the material and instructed to inhale it almost constantly both night and day. A kind of "bib" was devised on which the oil was sprinkled, and this was worn suspended from the neck, so that the air taken into the lungs was constantly impregnated by the vapour. It would serve no useful purpose to give details of these cases, as the results were uniformly unfavourable, and after a trial extending over a period of six months the treatment had always to be abandoned in favour of some other method. The clinical results were undoubtedly a failure, and it was with some anxiety that the conclusions of the bacteriological investigations were awaited. These experiments were undertaken by Dr. Blaxall in the bacteriological laboratory of the Westminster Hospital Medical School, and the details of the method adopted will now be explained.

The apparatus used for these experiments was as follows :

A and G. Flasks containing 1 in 1,000 mercury perchloride. B and F. Flasks containing sterilised distilled water. C. Gas-washing bottle containing experimental fluid. D. Sterilised empty flask. E. Jar containing tubes inoculated with tubercle bacilli. The arrows indicate the direction of the current of air. H. Connection through wall of incubator with water pump.

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