As much of the prejudice appeared to be traceable to the memorandum issued by the Royal College of Physicians, and to the more or less garbled summaries issued by local authorities, presumably on the advice of the Local Government Board, one is now justified in asking if the data on which that memorandum was based can be supplied, and if the statement that "draughts are harmful" was really the subject of careful investigation, or if the College was simply lending moral support to current superstition. I scarcely think that the harm from the advice "on the first feeling of illness or rise in temperature" (how many of the population possess thermometers?) "the patient should go to his bed at once" was balanced by the subsequent advice to "call in a doctor." If home conditions were ideal no one could take exception to the advice. The rest in bed would increase the ratio between the anabolic and katabolic processes in the body and thus raise the resistance of the individual cell; but that which may be good advice to a community where a high standard of living obtains may be detrimental where the standard of living is low. To advise people, who to avoid draughts normally place pads along window-sills, screens around beds, and even stuff paper into key-holes, that they should on the first symptom of illness leave their normal environment, go home to bed, and avoid draughts, is surely advising them to court disaster. This was not the intention of those who framed the memorandum, but this was the practical result of their advice.

As there are indications that the epidemic has not entirely exhausted itself, and that, given suitable climatic conditions, there may be a recurrence during the coming winter, attention may be called to the preventive measures suggested by the health authorities. In regard to the closing of places of entertainment or restriction of the hours of continuous performances in picture houses, I was unable to find a single case where infection could be definitely traced to this source. It can be seen that the place of entertainment could have no relation to the influenzal wave in this neighbourhood. To close these places can only increase the hours of congestion in the home, and to limit the hours of continuous performances can only increase the congestion of individual performances. The ludicrous suggestion as to the wearing of masks and even goggles was fortunately not adopted, for, if there be any advantage in wearing them, that advantage would be lost in the place where the wearing of them appears to be most necessary.

Toward the end of 1918 a stock vaccine was placed at our disposal and application was made for this, but I found it was suggested for use in prophylaxis. The use implied certain moral obligations to supply the Local Government Board with certain statistical information, which obviously to me could not be given. During the evening on which I received the vaccine I spent a quarter of an hour trying to persuade a husband to be inoculated, but he finally declined. He did not develop the symptoms. Theoretically, or under military discipline, vaccines may be of great value, but the time is not yet when we can line up masses of the civilian population and tell them to roll up their sleeves.

The value of the notification of pneumonia has already been commented upon.

Any medical man can realize and sympathize with the embarrassment of a department in the midst of a popular clamour to "do something," but it is to be hoped that that will not overrule the detached judgement. Much could be done, however, by the compulsory opening up of fever hospitals for the reception of cases where there is overcrowding in a house or where the early symptoms of the "secondary stage" are present. Cases removed to the Poor Law hospital appeared to do well; two insurance patients with lobar pneumonia and acute mania, which I regarded as hopeless when removed, made good recovery. This, I think, is associated with the phenomenon of the higher mortality among insurance patients; the environment of the house is more abnormal to the worker than to the housewife, whose mortality was remarkably low. There is, however, a certain prejudice to all Poor Law hospitals which will not be easily removed. Two of my cases who died informed me that while they would be willing to go to the fever hospital they would rather die than go to the "union." In the case of one—a pregnant woman who

was confined before her death—I felt sympathy for her point of view.

Apart from this I cannot suggest any steps which central authorities could take to break up the epidemic. It is difficult to see how the house-to-house spread can be prevented. Houses and habits cannot be altered by panic legislation in the midst of an epidemic. If people would follow their usual routine and realize the benefit of strong air currents there would be little fear of dangerous infections.

Much has been written about the relation of the general health of the community to the epidemic. There may be some relation, but so far as the suggestion that war conditions led to an impairment of the general health of the community, I am without evidence. During the two months preceding the epidemic there was a small visiting list as compared with previous years; there was the usual routine of the consulting insurance patient, but even amongst them there was nothing to indicate any marked impairment of health.

In regard to the after-effects of the epidemic, while it may still be premature to form an opinion, during the last three months I have only seen one of the observed cases with an illness which appears to be directly traceable to the infection, and during this summer there has been exceptionally little illness. In this fact may be found the true explanation for the small practice of the demobilized officer.

I am fully aware how little importance will be attached to the views here expressed, by those who frame regulations, but with the experience gained in over 1,000 cases, and with many hours spent in analysing the observations made, I cannot help but express the view that if public health authorities cannot be a help to the general practitioner, they should at least refrain from being a hindrance.

THE SCOPE OF CERTAIN GASEOUS DISINFECTANTS IN THE PROPHYLAXIS OF INFLUENZA.

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Since the publication of my note on the epidemiology of influenza among gas workers (BRITISH MEDICAL JOURNAL, March 1st, 1919) evidence has been accumulating that people working in an atmosphere containing certain gases obtain a marked degree of immunity during outbreaks of influenza. Shufflebotham (BRITISH MEDICAL JOURNAL, April 19th, 1919, p. 478) has brought forward an interesting series of figures pointing in the same direction. In the present paper my object is to describe some experiments undertaken with a view to determining the value of SO₂ and NO₂ respectively for the present purpose, and in doing so I may mention that latterly, through the kindly offices of the Medical Research Committee, I have been able to co-operate with Dr. Benjamin Moore, F.R.S., and Mr. Webster of their staff, whose report may be expected at an early date.

The problem for investigation may be summarized in two questions:

1. Is there any epidemiological evidence to show that workers in fumes are less attacked by influenza than others?

From all statistics at present at our disposal we venture to answer this proposition in the affirmative.

2. Is there any evidence to show that the fumes emanating from these manufactures have any influence on the vitality of bacteria in the post-nasal secretion of persons inhaling them?

It goes without saying that if a practical measure for preventing the spread of influenza by means of a disinfectant gas is to be elaborated, the concentration of this gas must be such that while exerting the requisite action on the secretion of the upper respiratory passages of those inhaling it, no untoward effect is produced. It may be stated at once that throughout the following experiments with SO₂ and NO₂ gases the concentration of these gases in the air of the room was so small as to be comfortably outside the limits of their toxic action.

Emphasis must also be laid upon another point in this relation. *A priori* it is exceedingly improbable that sterilization of the secretions of the upper respiratory passages can be effected by even prolonged inhalation of disinfectant gases in such low concentration as are now under consideration. It must be realized, however, that the problem is not one of sterilization, but of checking the spread of influenza; and it is conceivable, and even probable, that a moderate degree of disinfectant action on the secretion of the upper respiratory passages, while falling considerably short of complete sterilization, may nevertheless be of very great value in limiting the spread of infection, particularly if the action is such as to render this secretion even moderately unfavourable to the multiplication of the invading micro-organism.

Bacteriological Experiments.

The methods used were suggested by Gordon and Flack in their paper on the disinfection of meningococcus carriers.¹ Their investigations were confined to the use of the steam spray, though they pointed out at the same time that a disinfectant could conceivably be conveyed to the nasopharynx by means of gas. There is evidence from many sources that the use of the spray with high pressure steam did much towards the reduction of mass infection in meningococcal infection among troops, and now an attempt is here made to show that even better results can be obtained by using gases. The difficulties of applying the spray to masses of the civil population in times of epidemic are almost insurmountable, whereas in the form of gas a certain degree of disinfection of the upper respiratory passages could be brought to practically every home.

For the purpose of the valuation of the plates used in some of the experiments, the following standard has been adopted:

- ++++ = Growth profuse, colonies confluent.
+++ = Growth profuse, colonies less confluent, discrete colonies fairly evident.
++ = All colonies discrete.
+ = All colonies discrete and very small.
(+) = Very, very few colonies, all pin-point.
— = Sterile.

(a) Experiments in the Works.

Forty-three workers (some full time, others partial) were swabbed, and the results according to the above standard are set out in the following table:

	Gaswork Fumes.	HNO ₃ Fumes.	Acetone Vapour.	SO ₂ Fumes.	Total.	Per Cent.
++++	2	1	0	0	3	6.9
+++	4	3	0	1	8	18.6
++	0	0	0	1	1	2.3
+	5	5	0	1	11	25.5
(+)	6	4	5	1	16	37.2
—	1	2	0	1	4	9.3

In addition three non-workers were exposed to the SO₂ fumes in the roasting house of the tin mine for a period of 45 minutes.

Result: No. 1 (+)
No. 2 3 colonies
No. 3 (+)

Nos. 2 and 3 were further experimented on. Swabs were taken twenty hours after the above forty-five minute exposure.

Result: No. 2 +++
No. 3 ++

Swabs taken forty-four hours after—

Result: No. 2 +++
No. 3 ++

On another occasion four experimenters were swabbed after having been in the atmosphere of the roasting house of the tin mine for about an hour and a half. The result was a distinct diminution of the post-nasal growth, and the following values were placed on the plates three hours after exposure:

No. 1 ++
No. 2 ++
No. 3 ++
No. 4 +

The concentration of SO₂ in the atmosphere happened to be very dilute on this day.

(b) Laboratory Experiments with SO₂.

Two experimenters were employed; one was exposing plates and culture tubes to SO₂ fumes, and he was swabbed at different intervals after his exposure, with the following results:

One hour after (+)
Sixteen hours after (+)
Twenty-four hours after, on two occasions ++

On another occasion one was exposed for eight minutes and swabbed an hour after. Result: All colonies discrete and very small.

Another was exposed for fifteen minutes and swabbed an hour after. Result: Sterile.

The laboratory fumes were much stronger than those in the roasting house of the tin mine, but they could be easily borne without much discomfort, and tolerance was established in a very short time limit.

As a contrast to the laboratory experiments the results obtained on the workers in SO₂ fumes may be given *in extenso*:

Five workers, divided into two classes were swabbed. Class A consisted of three men always working in fumes; Class B of two men partially working in fumes.

Class A, No. 1... .. (+) Class B, No. 1 ++
No. 2... .. + No. 2 +++
No. 3... .. —

Laboratory Experiment with Nitrogen Peroxide (NO₂).

The nitrogen peroxide fumes were inhaled for about ten minutes by two experimenters. Swabs taken about an hour afterwards gave the following results:

No. 1... .. — No. 2 (+)

On another occasion four experimenters were exposed daily for five days, and swabs were taken at various intervals afterwards up to fifteen hours. It may be said, without going into individual detail, that all plates showed a very marked decrease in growth, though none were sterile.

For the sake of comparison the detailed results of the swabbing of fifteen workers in NO₂ fumes are given. Of these, two men swabbed during work=(+). In thirteen men just commencing a shift after twenty-four hours' rest (some whole-time fume workers, some partial) the following results were obtained:

In 1 ++++
In 3 ++++
In 0 ++
In 5 +
In 2 (+)
In 2 —

These results, obtained by swabbing workers, must be considered satisfactory, and, taken in conjunction with the experiments carried out in the tin mines and in the laboratory with SO₂ and NO₂ among non-workers, leave but little doubt that the fumes under review have a marked effect in inhibiting the post-nasal microbial growth of those exposed to them. Plates have only to be compared with what may be styled the "normal post-nasal plate," now so well known to all workers in cerebro-spinal fever, to note the vast difference in growth. In all the workers except three the growth was diminished, and in no less than sixteen the few colonies were just visible, and four plates were actually sterile. Among non-workers exposed in works, and in the laboratory experiments, the same results were obtained. Two plates were sterile and one nearly so (three colonies). Taken as a whole, 74 per cent. of the workers had their nasal passages well disinfected. Practically the same results were achieved among non-workers exposed at the respective works, and under similar conditions reproduced in the laboratory. It is not claimed that every nasopharynx will be rendered sterile by exposure to gas, nor is such necessary, but it is claimed that certain gases have a powerful inhibitory action on post-nasal flora, and that such action is quite sufficient to render many workers in those gases immune to disease which invades the body through the upper respiratory passages. Further, it is claimed that the same results cannot be achieved by the use of antiseptic and alkaline gargles, douches, and hand sprays, and other favourite methods now in vogue. It is needless to point out the difficulties that every worker in infectious diseases which have their origin in the upper respiratory passages has experienced in getting rid of his carriers and in preventing the spread of the disease, and until Gordon evolved the high pressure steam method of disinfection the case seemed hopeless, and the unfortunate carrier had to be left to fight his own battle against the invading micro-organism. Disinfection by gas, however, is an advance on steam, and is much simpler and easier of

application. It must be noted here that the nasal secretions of the experimenters were always acid.

Summing up all the evidence under this heading, we are justified in coming to the conclusion that gases have a profound inhibitory influence on the post-nasal flora of workers, and also in non-workers exposed both in the works and also under laboratory conditions.

Is there any evidence to show that fumes emanating from those manufactures have any action on inoculated plates and on microbes suspended in different liquid media?

The method of inoculating and exposing plates was that suggested by Gordon in the BRITISH MEDICAL JOURNAL of July 1st, 1916. A twenty-four-hour old broth culture of *Staphylococcus epidermidis* was used, and an equal amount of the germ was sown on each plate. The results of the plate exposures are shown graphically in the accompanying charts, except the plates exposed to SO_2 fumes, which are dealt with separately. The charts seem to indicate that the fumes of the oxide of iron purifiers have the most powerful inhibitory effect on microbial growth, a sterile plate being obtained with a ten-minute exposure (Figs. 1 and 2). The most remarkable result, however, is that shown in Fig. 3, where the plates were exposed on a

Charts showing Time of Exposure to Fumes Required to Kill Germs on Inoculated Plates.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

Experiment I.—Exposure in gas purifier (oxide of iron) while being discharged for cleansing.

Experiment II.—Exposure to fumes from heap of oxide of iron, twenty-four hours after discharge from purifier.

Experiment III.—Exposure in the open yard, surrounded by the different buildings where the various processes of gas making are carried on.

Experiment IV.—Exposure in nitrogen peroxide fumes during the manufacture of the acid.

plank lying on the ground in the open yard of a gasworks while the routine work of the day was being carried on. Experiment IV was carried out in the nitric acid retort house. The plates were exposed in the general atmosphere of the shed and direct to the fumes issuing from the retorts, and where the men were working. In general a certain variation is observed in most of the results with regard to the time of the exposure, but this can easily be accounted for by the fact that the fumes are practically discharged into the open air, and therefore subject to great irregularity of atmospheric dilution.

The action of SO_2 fumes on inoculated plates is entirely negative, as shown by the following experiments:

Experiment 1.—(a) In the Tin Mine.

Ten plates were exposed to the fumes emanating from the ovens in the roasting house of the tin mine for periods varying from five to thirty minutes.

Result of all plates +++++

Experiment 2.—(b) In the Laboratory.

Sulphur dioxide (SO_2) fumes were generated in the laboratory, and six inoculated plates were exposed for periods varying from twenty to forty-five minutes.

Result of all plates +++++

From these results it was evident that Gordon's method of testing inoculated plates is not adapted for the case of SO_2 fumes.

The method of using inoculated plates was therefore abandoned and attention was directed to bubbling the gas through the suspensions of organisms in liquid media. The following experiments were carried out with different gases:

Experiment 3.— SO_2 . (a) In the Tin Mine.

Gas bubbled through a saline suspension of *Staphylococcus epidermidis* at the time the men were at work for twenty minutes gave a very marked reduction of colonies after nine and ten hours' incubation, as compared with the control.

Experiment 4.—(b) In the Laboratory.

Half an ounce of sulphur was burned in a room of 1,000 ft. cubic capacity. The resulting atmosphere was borne without

the slightest discomfort, and very little irritation was noted in the respiratory passages. This atmosphere was sucked through three wash-bottles containing different media and each inoculated with one loopful of a known suspension (Bottle I contained a saline suspension; Bottle II a broth suspension; and Bottle III a broth and horse serum 10 per cent. suspension). The three bottles were bubbled simultaneously, so that each had the same dose of gas. Bubbling was kept on for twenty minutes and the bottles then placed in the incubator.

TABLE I.

	BOTTLE I.	BOTTLE II.	BOTTLE III.
Reaction after exposure	Slightly acid	Distinctly acid	Distinctly acid
	No. of Colonies per c.cm.	No. of Colonies per c.cm.	No. of Colonies per c.cm.
Control before bubbling	7,300	8,000	8,000
After incubation for			
1 hour	6,400	9,000	7,800
2 hours	60	Sterile	8,000
3 "	Sterile*	14	8,200
4 "	—	28	9,600
5 "	—	14	8,500
6 "	—	Sterile*	9,400
7 "	—	—	10,300
9 "	—	—	11,400*

* Bottles I and II were still sterile at the end of twenty-seven hours. The number of colonies per c.cm. in Bottle III remained about 11,400 up to twelve hours; at the end of twenty-seven hours they were uncountable.

The result of this experiment shows that even in a very rich medium the passage through it of an atmosphere feebly diluted with SO_2 was sufficient to inhibit the growth of microbes. The third part of the experiment was therefore carried further and a control used.

TABLE II.—Broth with 10 per cent. Horse Serum.

	Control (Serum Broth).	Serum Broth treated with SO_2 .
	No. of Colonies per c.cm.	No. of Colonies per c.cm.
Controls before bubbling	21,700	18,200
After incubation for		
1 hour	27,000	Dose of gas (10 mins.), 16,500
2 hours	25,000	15,100
3 "	25,000	21,500
4 "	29,000	29,000
5 hours	35,000	Dose of gas repeated (10 mins.), 19,800
6 "	All plates after this period uncountable	17,800
7 "	—	16,100
8 "	—	3,700
9 hours	—	Dose of gas repeated (10 mins.), Sterile, and remained so at end of 13 hours

From this it is evident that, no matter how rich the medium is, a weak atmosphere of SO_2 has the power of killing the microbes, and further, that repeated small doses are more efficacious than one long dose. Judging from the figures it would appear that the medium was sufficiently impregnated by the second dose to inhibit all growth.

Experiment 5.— NO_2 . (a) In Cordite Factory.

A saline suspension through which the atmosphere of the HNO_3 house was bubbled for two hours yielded sterile plates after six hours' incubation, and they remained sterile at the end of twenty-four hours.

Experiment 6.—(b) In the Laboratory.

The experiment with the three media was carried out using the same technique as in the case of SO₂.

TABLE III.

	BOTTLE I.	BOTTLE II.	BOTTLE III.
Reaction after exposure	Slightly acid	Distinctly acid	Distinctly acid
	No. of Colonies per c.cm.	No. of Colonies per c.cm.	No. of Colonies per c.cm.
Control before bubbling	57,600	53,100	50,720
After incubation for			
3 hours	45,920	—	22,400
6 "	20,800	60,800	24,960
9 "	Sterile	Uncountable	Uncountable

Note.—Bottle I contained a saline suspension; Bottle II a broth suspension; and Bottle III a broth and horse serum 10 per cent. suspension.

Experiment 7.—(a) In the Works.

Experiment with fumes from spent oxide of iron turned out of "coal-gas purifier" exposed to the atmosphere in the process of revivifying for repeated use. This gas was bubbled through a saline suspension for twenty minutes and placed in the incubator.

Number of colonies after 4 hours' incubation ...	20
" " after 6 " " "	sterile
" " after 8 " " "	sterile

Experiment 8.—(b) Chlorine Gas in the Laboratory.

This was bubbled through a saline suspension, with the result that the plates were sterile after six and eight hours' incubation.

Plates of swabs from two experimenters exposed showed no diminution in growth, and as the effects of the gas on them were so disagreeable no further trials were made in this direction. Twenty-four inoculated plates which had been incubated for twenty-four hours and showed varying growths of the organism were placed in an airtight box. A massive dose of chlorine gas of a strength of between 1 in 1,000 and 1 in 2,000 was introduced to see if further growth could be inhibited. The box was left at room temperature for twenty-four hours. On opening the box at the end of this time a distinct odour of chlorine was perceptible, but notwithstanding this and the massive dose given there was a distinct increase of growth on all the plates.

9. Other Experiments in the Laboratory.

Six sterile plates were exposed in an ordinary room for two hours. At the end of twenty-four hours' incubation they yielded a total of 53 colonies, an average of 8.8 colonies per plate. The room was then gassed with NO₂ for two hours. During this gassing period an inoculated plate was exposed, and yielded only 24 colonies, and it was noted that the agar was distinctly yellow. At the end of two hours' gassing a further six plates were exposed for two hours, and those yielded at the end of twenty-four hours' incubation 21 colonies, or an average of 3.5 per plate. This experiment was repeated with the following result: Six sterile plates gave 32 colonies, or an average of 5.3 per plate. This was reduced to 17, or 2.8 per plate after gassing.

Practically parallel findings were obtained with SO₂ before and after treatment of the atmosphere, the growths being about halved. From all these experiments no doubt remains but that these fumes, both in the factory and in the laboratory, have a powerful inhibitory influence on the growth of microbes.

Practical Application of these Investigations.

An attempt was now made to bring the results into practice. There was an outbreak of influenza at a camp during this time, and it was resolved to try to disinfect the men *en masse* with NO₂, and a drying room was set aside as an inhalatorium. To generate the gas, strips of copper and HNO₃ were used. The concentration of nitrogen peroxide in the air was so graded that the odour was by no means irritating or disagreeable to bear, and the men were kept in it for fifteen minutes. No one made complaints as to any ill after-effects. The battalion was unfortunately in the process of disbandment, and as a consequence discipline was somewhat lax. It was impossible to keep accurate records, and the men

subjected themselves to the treatment voluntarily. Notwithstanding this, some 400 men were passed through the inhalatorium during a period of five days. Many of the men were being sent away in drafts to the disbandment centre; it is much to be regretted that no figures are available as to the effect of the treatment on the incidence of the epidemic. But one fact was clearly established—namely, that it is quite practicable to expose bodies of men to a dilute atmosphere of NO₂ in the same way as the steam spray without the slightest discomfort or harm to the individual.

The next experiment was carried out on a body of civilians. A gang of navvies building a dry dock was housed in a large disused grain shed in the docks. The ground floor was used as a mess-room and kitchen, with rows of gas stoves. There were no windows for light and ventilation, which was obtained through two large double doors. A stair led up from the mess-room to the men's sleeping quarters, which were far from ideal, being a replica of the mess-room, with the exception that there were three double doors through which goods were hoisted. These were kept open during the day when weather conditions permitted. The men slept on bed-boards and the usual army mobilization standard of 400 cubic feet was allocated to each man. There were fifty men in occupation and they kept the quarters quite clean. Two cases of influenza were reported late one evening, and they were removed to the hospital on the following morning. They may be classed as severe, but uncomplicated. With the willing co-operation of the contractor and the navvies it was agreed to use SO₂ gas as a prophylactic. Half an ounce of sulphur per each 1,000 cubic feet space was burned slowly in the sleeping quarters while the men were going to bed and on rising in the morning. This dilution caused no discomfort and little irritation in the nasal passages, and the double dose was continued for fourteen days, and no other case occurred. The numbers are far too small to draw any definite conclusion as to the value of the procedure, but the result is striking when all the conditions under which the men were living are taken into account, for it may be said with confidence that these were ideal for the spread of any spray-borne disease. Just as in the case of the NO₂ gas with soldiers, this experiment brings out the fact that it is quite practicable to disinfect large bodies of the civil population with gas in times of epidemic. The *modus operandi* of the disinfection was carefully explained to the men, and they entered enthusiastically into the experiment.

SUMMARY.

1. Workers in gas fumes have shown a certain amount of immunity during the recent waves of influenza, as compared not only with other classes of the community, but also in one instance with those working in the same factory but not in a fume department.

2. Post-nasal swabs taken from employees at the time of working, and also after being twenty-four hours off duty, showed either a very marked decrease in the growth of microbes in nearly every instance or were sterile. The same observation holds good in regard to non-workers experimented on in the works and in the laboratory.

3. With one exception—namely, SO₂—plates inoculated with the *Staphylococcus epidermidis* and exposed to the fumes of the factories showed a marked diminution in growth, and in one instance sterility was attained.

4. SO₂ had no action on inoculated plates. But when this and other selected gases were bubbled through suspensions of organisms, in various liquid media, the growth was completely inhibited.

5. It has been definitely proved that groups of men can be exposed to NO₂ and SO₂ gases for lengthened periods during epidemic times without the slightest discomfort or harm to anyone.

6. There was no evidence of nasal irritation and consequent increased flow of mucus among the workers. Further it was noted that among non-workers exposed in the works, in the laboratory, and in the inhalatoria, any initial irritation caused by the fumes quickly disappeared, and that tolerance was quickly established.

7. The nasal secretions after exposure were always found to be acid.

8. It is suggested that the mode of action of NO₂ and SO₂ fumes may be that as the secretions of the upper

respiratory passages are rendered acid a medium is formed which is inimicable to microbial growth.

Note on Immunity from Second Attack.

Navy.—Of 321 cases in patrol in the July epidemic, 2 had return attacks in the October-November epidemic.

Army.—A company of Royal Garrison Artillery had 25 cases in July. None of these were attacked in the October-November epidemic. In a battalion: Of 21 cases of the July epidemic traced none were attacked in that of October-November.

N.E. Works.—From July 10th to 23rd, 73 males and 59 females were attacked; from October 16th to 29th, 29 males and 61 females. Two males and four females were attacked in both epidemics.

From the above figures it would therefore seem that an attack conferred immunity for a certain time.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, November 18th, 1916.

INTUSSUSCEPTION DUE TO POLYPUS OF SMALL INTESTINE.

BY

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THE following case is of interest in view of the number of attacks spread over a long period.

History.

L. H., aged 5, had been under the care of Dr. Watts of Haddon Close. He reported that this boy had suffered all his life from acute intestinal paroxysmal attacks, preceded by vomiting, and followed by tenesmus with the passage of blood and slime. They varied in severity, lasted from twenty-four to thirty-six hours, and occurred about every six weeks. The pain during several of the attacks was most marked in the right iliac fossa. They were thought at one time to be due to chronic constipation, but they persisted even when the bowels had been carefully attended to. On two previous occasions the child had been admitted to hospital, but in each instance the attack passed off, and there seemed to be no direct evidence of intussusception.

Operation.

On April 18th, 1919, he was admitted to the Radcliffe Infirmary under my care. The pulse was 120 and the temperature 99° F. He was then suffering severe abdominal pain; there was some distension, and a mass could be felt in the transverse and descending colon. On examining the rectum a little blood came away on the finger.

The diagnosis of intussusception was made and operation at once undertaken. An incision was made in the middle line below the umbilicus, and the apex of the intussusception found to be in the descending colon. Reduction was easy at first until the appendix appeared, when there was a hitch, due to a lump which could be felt in the caecum, and which refused to pass back through the ileo-caecal valve. Time and patience overcame this difficulty, and reduction was eventually obtained.

The mass, which was about the size of a walnut, was situated in the small intestine eighteen inches from the ileo-caecal valve, the bowel wall being dimpled on the anti-mesenteric border, where it was attached. A longitudinal incision was made in the bowel, and a sessile polypus ligatured and removed. The incision in the bowel wall was closed transversely, and at the same time a very long appendix was removed.

After-History.

The child made a good recovery, but six weeks after the operation there was a slight attack of abdominal pain which soon passed off. The polypus proved on examination to be an adenoma.

The intussusception was of the entero-colic type, the small intestine with the polypus at its apex passed through the ileo-caecal valve for some distance, the caecum, appendix, and colon being subsequently drawn in. The remarkable feature of the case is the attacks of pain, which appear to have occurred at intervals ever since birth. It is probable that in the previous attacks the intussusception was confined to the small intestine, the polypus approaching to or reaching the ileo-caecal valve, but not passing through it until the final attack.

THE National Academy of Medicine and the Surgical Society of Rio de Janeiro are compiling a catalogue of all medical publications that have appeared in Brazil within the past hundred years. This catalogue will be distributed at the celebration of the Centenary of Independence which is to be held in 1920. A Congress of Medicine will be held at the same time in Rio de Janeiro under the direction of Professor Fernando Magalhães, president of the Sociedade de Medicina e Cirurgia.

A CASE OF STRANGULATED HERNIA WITH VOLVULUS.

BY BASIL HUGHES, D.S.O., F.R.C.S.,

MAJOR R.A.M.C. (T.F.).

THE following case is of interest for several reasons: First, volvulus occurring in a hernial sac is rare; secondly, the symptoms were remarkably mild considering the condition that existed; and thirdly, the patient gave no trouble during convalescence and the wound healed by primary intention despite the offensive nature of the sac contents.

W. R. was admitted to No. 39 Stationary Hospital on February 14th, 1919, suffering from left-sided strangulated inguinal hernia.

History.—He had had a small left-sided hernia for some months. The day before admission to hospital, after a bout of coughing, the hernia came right down into the scrotum, causing pain and vomiting.

Condition on Admission.—He vomited a brownish inoffensive fluid; he did not seem particularly distressed and he had not an abdominal facies. The temperature was 99° and the pulse 66, good, regular, and steady. He had passed neither flatus nor faeces since the previous day. The abdomen was distended, not particularly tender, but he complained of some pain in the epigastric region. No visible peristalsis was observed. There was a large tender tumour occupying the left inguinal canal and the left side of the scrotum, and the skin of the scrotum at one spot was red and tender. There was no impulse in the mass on coughing; there was definite fluctuation and the tumour was resonant to percussion.

Operation.—The usual incision for the radical cure of hernia was made, but continued a little way on to the distended scrotum. On opening the sac a quantity of blood-stained and very foul fluid escaped. A large gangrenous mass of omentum clothing a loop of gangrenous large intestine was present. The internal abdominal ring was next enlarged, and both bowel and omentum pulled down until healthy tissue was reached. It was then found that the bowel was twisted on itself at the internal ring and that a true volvulus existed. Healthy bowel was pulled down with difficulty. The gangrenous omentum was removed and the gangrenous bowel resected, end-to-end anastomosis being performed. This done, the anastomosed bowel was returned and the radical cure of the hernia was completed, a small glove drain being left under the skin owing to the infected condition of the contents of the sac. The abdomen was then opened by a left pararectal incision, as I was not wholly satisfied as to the true state of affairs. It was then ascertained that the portion of the bowel dealt with was the pelvic colon, that the anastomosis was satisfactory, but that there was fluid present in the peritoneal cavity which was blood-stained but inoffensive. No peritoneal drain was employed.

Curiously enough the wounds healed by first intention, though the inguinal wound was red and looked like suppurating forty-eight hours after the operation. The glove drain was removed at the end of forty-eight hours and the stitches on the tenth day. The bowels moved on the fourth day, and the patient made an uninterrupted recovery.

THE MOVING-WATER BATH.

BY

LIEUT.-COLONEL A. D. WEBSTER, V.D., O.B.E., M.D.

THE effects, both reflex and mechanical, of moving water are apparent in sea-bathing. The pressure and impact of the waves are stimulating, flushing the skin and calling into more or less activity many muscle groups. The surging and the spray below a waterfall have a similar action and reaction. These effects and results have been happily obtained and applied to many morbid conditions of wounded soldiers. It has been found that the muscles of the injured part are invigorated and their nerve connexions restored more rapidly under the influence of moving water. Earlier mobilization is secured.

The temperature of the water is a prime factor and its maintenance a necessity. This temperature need not be very high (cool 65° to 70°, tepid 80° to 85°, or warm 95° to 100° F.), but the effect of the moving water gives the impression through the skin nerves that the temperature is lower than it actually is.

The effect on the tissues resembles that produced when salt has been added to the water or carbonic acid gas generated. The moving water in the bath may be electrified for additional effect, the current being taken from a dry cell faradic or galvanic battery, or the sinusoidal current may be employed.