arsenoxide so formed reacted with sulphhydryl groups in the body tissues and in the spirochaetes. Hogan and Eagle (1944) showed that the toxicity of any arsenoxide depends on its constitution and its ability to combine with essential functional groups in vital organs.

Many of the enzymes concerned with carbohydrate metabolism are known to be inhibited by reagents which react with sulphhydryl groups (Cori, 1946), and detailed work on this subject has been carried out by Barron and Singer (1945) using a variety of reagents. Glutathione is one of the most important substances in the body containing the thiol group. It is probable that the vitamin-protein enzymes are similarly adversely affected by organo-arsenicals, for it is known that arsenic interferes with the conversion in the liver of vitamin B₁ to its co-enzyme form. The poisoning action of arsenoxide on glutathione is probably one which involves oxidation of its thiol group to a disulphide, resulting in the production of oxidized glutathione. This in turn will bring about the inactivation of succinic dehydrogenase, and as glutathione acts as a catalyst for glyoxalase, the action of this latter enzyme will be also in abeyance. Damage even more widespread will follow; the presence of the sulphhydryl group in several oxidizing enzymes, as well as in several proteolytic and other enzymes, has been shown to be necessary for their activity (Bersin, 1935; Hellerman, 1937; Barron and Singer, 1945). In view of the fact that oxidizing agents in the cell tend to inhibit the activity of -SH enzymes, it is probable that one of the main functions of glutathione in cellular systems is concerned with the continuous reactivation of the -SH enzymes. Its capacity to bring about such a reactivation through its powerful reducing action has been demonstrated in many experiments.

Once enzymic balance has been upset recovery is very possibly hard to effect, and reactions will proceed in one direction faster than metabolism can control them: Lactic acid synthesis is retarded to such a degree that enzymic control in other directions is affected by the building up of aldehydic compounds. It is postulated that this is due to the inactivation of glyoxalase and succinic dehydrogenase, with a subsequent block in the tricarboxylic acid cycle.

The following chain of events leading to the development of arsenical encephalopathy has been suggested by Lydon: (1) Interference with cellular metabolism. (2) Accumulation of metabolites in C.N.S. cells (which are most sensitive to changes in oxygen tension). (3) Increased retention of fluid by cells, with oedema of tissues. (4) Interference with normal capillary circulation. (5) Congestion and subsequent focal necrosis. The characteristic pathological changes found in fatal cases support this theory.

The immediate treatment of post-arsenical encephalopathy should be one which aims at preventing the establishment of the vicious circle mentioned above and opening the way for the restoration of the metabolic sequence known as the Krebs tricarboxylic acid cycle. While it has been shown that the toxic action of arsenoxide is inhibited by the intravenous administration of reduced glutathione (Voegtlin *et al.*, 1925), recent studies have proved that the most effective compound in use as an antidote against heavy metal poisoning is 2,3-dimercaptopropanol (BAL), which in dogs is many times more effective than glutathione (Long and Farah, 1946). It is recognized that these compounds exert their maximal therapeutic action when given at the earliest possible opportunity after a diagnosis of organo-metallic intoxication has been made. As excess of succinate protects its dehydrogenase from the inhibitory effect of oxidized glutathione, the combination of a succinate and an organic thiol compound given parenterally should, in theory, give the maximal therapeutic result if administered immediately arsenical intoxication is suspected.

The practice of using intravenous glucose does not appear to be physiologically sound in view of the fact that a disturbance of carbohydrate metabolism is occurring. Double-strength plasma would seem to be the agent of choice in counteracting cerebral oedema. The use of a compound such as calcium thiosulphate does not present an available thiol radicle but merely introduces sulphur in inorganic form. One of the organic thiol or di-thiol compounds mentioned above will produce a far greater and more rapid therapeutic effect. These compounds are now quite easily obtainable.—I am, etc.,

E. A. J. BYRNE.

Lancaster.

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Treatment of Post-operative Pulmonary Atelectasis

SIR,—The annotation on a new treatment for post-operative atelectasis (March 22, p. 386) prompts me to inform you of a method of dealing with this condition which I have used occasionally during the past two years. The method is to stimulate coughing by the introduction of 1 ml. of water, by means of a syringe, into the respiratory passages, the needle being passed into the trachea at about the level of the first ring—that is, below the cricoid cartilage. This method is not intended to supplant bronchoscopic aspiration, which, all observers agree, is the ideal method of treatment, and which should be undertaken as soon as signs of atelectasis appear, but the introduction of water may serve as a simple substitute if the facilities for bronchoscopic aspiration are not available.

The last case which I dealt with by this means was a man of 44 who had had a Polya gastrectomy for duodenal ulcer on March 4, 1947. When I visited him on the evening of March 5, he had an atelectasis of the left lower lobe. The surgeon who had operated on the case had left instructions that he was not to be disturbed, and, as he was not to be found, I decided to employ the water technique, though I should have preferred to use the bronchoscope. The effect was excellent: after a violent spasm of coughing, in which considerable sputum was brought up, he stated that he felt better, and his dyspnoea disappeared at once. He continued to bring up sputum for a few days, but all signs of atelectasis had gone, and the temperature, which had been raised on the evening of March 5, became and remained normal.

The birth of this method occurred when I was anaesthetist to a surgical team for chest surgery in the B.L.A., the surgeon in charge being Major J. Leigh Collis, of Birmingham. A patient was brought in with collapse of the right lower lobe, the cause being a piece of tinned bacon which he had inhaled. I anaesthetized the patient for bronchoscopy by swabbing the pyriform fossae with 15% cocaine, and then introduced 1 ml. of the same fluid into the trachea through the top ring. The patient immediately coughed and expelled the greater part of the inhaled bacon. This suggested to Major Collis and myself the method of causing expulsive coughing which I have described above.

I am tempted to make two comments on Grandstaff's work, to which your annotation was directed. First, although I have not seen the original article, I find great difficulty in believing that, of a total of 2.6% of respiratory complications following operation (an extremely low figure), two-thirds had pneumonia. My own experience, in common with everyone else whom I have consulted, shows that atelectasis is by far the commonest of major respiratory post-operative complications, and that the pneumonia rate is only a very small fraction of this. Secondly, while not denying the possibility, remote though it appears to be, that analgesia of the larynx may cause dilatation of the bronchi, it would hardly appear that this of itself would cure atelectasis: it is also necessary that the offending plug be removed, either by aspiration or by coughing. With all due deference to the author of your annotation, swabbing of the pyriform fossae does not "inevitably produce severe coughing"; in fact, it practically never does. For this reason Grandstaff's method might well be improved by stimulation of coughing by some such means as I suggest.

While on the subject, I should like to mention a point of diagnosis which I have never seen in print: the dyspnoea in atelectasis is always more severe than the physical signs would appear to warrant, and the sudden onset of severe dyspnoea after operation is strong presumptive evidence of atelectasis.

It is a very encouraging sign that attention is now being directed to the diagnosis and treatment of post-operative atelectasis. Lives have been saved, and many days of convalescence averted, by the prompt use of the bronchoscope. It is most necessary that all anaesthetists should become expert in the use of this instrument, and also expert diagnosticians of thoracic disease. Too often, even now, surgeons are content to classify all cases of atelectasis, bronchitis, pneumonia, or what-have-you as "anaesthetic chests" and to bother no more about them.

In conclusion, while stressing the need for early bronchoscopic aspiration, let it not be forgotten that postural coughing,

stimulant cough medicines, breathing exercises, and carbon dioxide also have their place in the treatment of post-operative atelectasis.—I am, etc.,

Newcastle-upon-Tyne.

M. H. ARMSTRONG DAVISON.

Penicillin for Breast Abscess

SIR,—A recent article by Florey, MacVine, and Bigby (Dec. 7, 1946, p. 845) stimulates me to present the results of a series of cases treated by one method which they employed—namely, aspiration of the abscess and injection of penicillin solution into the cavity. The technique employed was essentially similar to that which they advocate. The cases referred to presented themselves mainly in the spring of 1946, when the shortage of beds was extremely acute. Previous work on the value of penicillin used locally in abscess cavities of various types, both acute and chronic, infected with the staphylococcus, and particularly the occasional reports of breast abscess treated by such methods, suggested that these cases might respond to local penicillin. They were therefore treated as out-patients in the casualty department of the Royal Infirmary, Leicester.

The series consisted of 24 cases of whom 15 were primipara and 9 were multipara. Of the latter, two presented with abscesses in both breasts, and four gave a history of mastitis in a previous pregnancy, including both the bilateral cases. About one-third of the mothers had not persisted with breast-feeding for more than a few days, and subsequently had not regularly emptied the breasts.

The abscesses were first seen in various stages of suppuration from early localization to obvious fluctuation. All cases were treated as follows. Aspiration of the abscess was carried out using a wide-bore needle and with full sterile precautions. Pus was found in every case. The pus was replaced with calcium penicillin in normal saline in amounts varying from 50,000 to 200,000 units through the series. A light general anaesthetic was employed with very nervous patients. Cultures of the pus were made in each case and all yielded penicillin-sensitive *Staph. aureus*. The procedure was repeated in 24 hours in all cases. In 19 cases, including one bilateral, relief from pain was considerable within the first 24 hours of treatment. In the remaining five cases the abscesses remained large, and further daily aspirations up to the fifth day were made. These were all late cases when first seen, with well-established cavities. Two eventually healed after discharging freely from the sinuses which had formed along the needle tracks. The remaining three required incision and drainage.

Of the 19 cases which cleared up satisfactorily, 2 relapsed, one after 10 days and the other after 16. Both were given two further aspirations and injections of 100,000 units of penicillin, after which they healed with no further trouble. *Staph. aureus* was again grown from both.

All the cases in the series were given a routine course of 30 mg. of stilboestrol spread over five days and the normal breast was manually expressed until the flow ceased. In the 19 cases which responded well the total duration of treatment until complete recovery was approximately two weeks, although in some cases a firm painless nodule could be felt up to the fourth and fifth week. The quantity of penicillin injected appeared not to affect the recovery time to any marked extent. In about half the cases, particularly those from which fairly large quantities (more than 5 ml.) of pus were aspirated, sinuses formed along the needle track and pus discharged freely. All dressings were therefore performed with a completely sterile technique.

(1) The series is too small for generalization, but it seems clear that in cases seen early in the stage of localization, when the volume of the abscess is small, this method of treatment is a satisfactory one and an improvement on surgical methods; however, in late cases where large cavities are present it would appear not to be efficacious except as an adjunct to incision and drainage. In this case the intramuscular route is probably the best method of administering the penicillin.

(2) These cases can often be treated in a satisfactory manner as out-patients without surgery, particularly in view of the present bed shortage.

(3) Inquiries among several practitioners in the district suggest that the aetiology of many cases in an industrial town such as this is closely connected with the fact that many women resume work shortly after the puerperium and find it inconvenient or impossible to continue breast-feeding. They do not, however, empty the breasts adequately and stagnation of milk occurs.

I am indebted to Mr. Rizelle, the surgeon in charge of the casualty department, for permission to publish this article and for his advice at all times.—I am, etc.,

West Drayton, Middlesex.

S. J. KRISTER.

Co-opted Members on Negotiating Committee

SIR,—It may not be obvious to everyone that the sub-committees of the Negotiating Committee contain the names of many co-opted members, but it is a fact which, I think, needs definite stressing. It is no doubt necessary to adopt this procedure in order that each particular division of practice should receive the fullest consideration in relation to the Act.

In view of the amount of careful thought, time, and trouble which have been bestowed on the negotiation and election of the Negotiating Committee, it is to be hoped that the votes of such co-opted members will in no case outweigh those of the elected members, especially when one remembers that the report of the Negotiating Committee on a previous occasion was in fact the report of a small subcommittee which was put, quite formally and without the opportunity for discussion, to the full Negotiating Committee before being considered by the Council.—I am, etc.,

Hungerford, Berks.

D. H. STUART BOYD.

National Health Service Act

SIR,—Dr. D. G. ff. Edward (March 15, p. 352) contends that we ought not as a profession to oppose the new medical service Act because to do so is undemocratic. May I try to expose the fallacy of such argument? Many besides him are bemused by it nowadays. In fact the general cry is for democracy as the universal cure-all.

A little reflection will show that a whole-hog version of it can never achieve real efficiency in government for the simple reason that its actions can only be the resultants of the more or less fused ideas of every individual on the electoral roll. Some may be very well informed and well balanced while others will be comparatively ignorant or stupid or both. Efficiency under the democratic system is only to be achieved when people will curb themselves and refrain from interfering in matters they do not understand. On the other hand, those who do understand should assert themselves and explain to, persuade, and be prepared to lead their fellows. That is what our position should be. The general mass of the people is as profoundly ignorant of the working of our profession as it is of the science and art of medicine. If we keep silence we let the whole affair go by default, for we have abundant evidence that the Government itself is little if any better informed in this business than the "man in the street."

Anyone desiring to study this matter further will do well to read *The Limits of Pure Democracy*, by W. H. Mallock; Chapman and Hall; 1918—a veritable mine of information and sound thought.—I am, etc.,

Doncaster.

W. REGINALD WILSON.

Trichlorethylene in Midwifery

SIR,—Perhaps some of those who have inquired about the use of trichlorethylene in midwifery might care to try the simple, cheap apparatus which I described in 1944 in the *Journal of Obstetrics and Gynaecology*.

The first apparatus was improvised in a few minutes and could be again by anyone wishing to try the method. The concertina rubber tube is disconnected from a standard Boyle's gas-oxygen machine, complete with face-piece and three-way gas-cock. The free end of the tube fits nicely over one neck of a 16-oz. (450-ml.) Woulfe's bottle. A piece of standard rubber drainage tube is inserted into the other neck of the bottle so as to fit closely and reach to within about two inches of the bottom. It is then cut off flush with the neck, the natural curve of the tubing being allowed to direct it to the centre. The mask must be of the inflatable rim type and in good condition. In the absence of positive pressure from gas cylinders, etc., the