and temperature were 56, 100, and 103° respectively. On the seventh day the respirations rose to 72, the pulse to 116, and the thermometer stood at 104°. There was some delirium, and marked restlessness. On the eighth the face was cyanosed, delirium more pronounced, and physical examination revealed the fact that the pneumonia had extended to the middle and upper lobes. The expectoration was rusty, but very scanty. During the next few days the temperature varied from 99° to 101.5°, but was seldom above 101°; the pulse from 95 to 105, and the respirations from 32 to 60—average 45. On the eleventh day the delirium subsided, and the patient's general condition improved, and crepitus *redux* was to be heard at the base of the right lung. After the fourteenth day the temperature and pulse, though still indicating the febrile state, moderated considerably, but the breathing remained about 40 in the minute. Dulness continued at the right base, and the breath sounds and crepitations gradually became more feeble and distant. On the twenty-first the chest was explored, and pus drawn off by means of the hypodermic syringe. On the twenty-eighth day paracentesis was performed, and thirty ounces of pus withdrawn. On the forty-second day, as the base was still relatively dull, the needle was introduced once more, but with negative result. Eight days later the chest was again explored at the point of maximum dulness, and the result was the same. By degrees the dulness disappeared, and the patient made an excellent recovery.

This case cannot certainly be said to be unique, and I am disposed to think that if practitioners who have met with instances of empyema cured by one tapping will endeavour to recall the earlier history of the case they may be persuaded to admit a pneumonic origin. In conclusion, I would venture to suggest that some, at least, of the recorded cases of abscess of the lungs following pneumonia have been limited empyemas that have found their way through the visceral pleura. True abscess of the lung, apart from sepsis or tubercle, I have never seen, and I have now for upwards of thirteen years superintended the *post-mortem* examinations at our Royal Infirmary.

EXPERIMENTS UPON THE INFLUENCE OF THE MINERAL CONSTITUENTS OF THE BODY UPON IMMUNITY FROM INFECTIVE DISEASES.

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ONE of the most striking points in regard to infective diseases is the degree in which animals resist their attacks or succumb to them. The direction in which an explanation of this phenomenon is at present chiefly sought is the powers of living cells to destroy intruding microbes, or of albuminous substances in the blood or lymph to destroy the invading microbes and to neutralise the action of their poisonous products. The differences which exist between albuminous substances are probably due in part to their different molecular weight, but we also know that the reactions of many albuminous bodies are greatly modified by the various proportions of inorganic constituents, such as soda, potash, or lime, in the fluid which dissolves them, or from which they may be precipitated by heat or by various reagents.

It has been found by Gilbert and Lawes that the ashes of different animals are not alike in their composition, and it seems therefore possible that a difference in the mineral ingredients of an animal's body may be one of the factors in determining the amount of resistance it may present to infective diseases.

In a research made by one of us (Brunton), along with Cash, it was found that not only was the effect of barium on the frog's muscle counteracted by potash, but by feeding an animal for some time with potash the poisonous action of barium could be to a considerable extent counteracted, the potash appearing to have accumulated in the body to such

an extent as partially to antagonise the barium, which was afterwards administered. By treating an animal with perchloride of mercury, Cash succeeded in conferring immunity against anthrax, so that when subsequently inoculated it remained alive, while a control animal died in a few days. These facts seemed to render it worth while to undertake a research into the effect of the administration of potash, soda, or calcium in increasing or diminishing the resisting power of animals to anthrax. The effect of sodium bicarbonate has already been tested by Fodor, but his experiments were directed to the effect of it upon the alkalinity of the blood, and not to the effect of the base as compared with other alkalies or alkaline earths. His experiments seemed to show that sodium bicarbonate tended to confer immunity, for of nineteen rabbits treated by injection of its solution and then inoculated with anthrax, seven survived, three developed the typical disease, while in the remaining nine the cause of death was uncertain. M. Chor¹ has performed similar experiments, but with different results, for he found that animals thus treated not only did not recover from the disease, but died almost uniformly before control animals inoculated without previous preparation. He found, also, that by using the alkali, as recommended by Fodor, death might ensue from this alone without subsequent inoculation. These experiments seem to show that the alkalinity of the blood is not the important factor in resistance, and it is possible that the contradictory results of these observers may have been partly due to the nature of the food which the animals received before and during the experiments. But in all probability the soda salts were kept rather in excess in the animal by the administration of the drug, and we may regard them as indicating that an increased proportion of sodium does not tend, to any great extent at least, to confer immunity, although the increased resistance observed by Fodor might be explained on this hypothesis as well as on that of increased alkalinity.

In the present paper we intend to consider the effect of potash, reserving for another communication the effect of lime, magnesium, and alumina, as our experiments on them are not yet concluded. In February of this year we commenced the research by feeding a number of guinea-pigs with bran containing potassium chloride (30 to 60 grammes per kilo.). They took this food readily, and were fed on it and on cabbage for periods varying from three weeks to three months. They all maintained excellent health and in no case lost weight. The animals were then inoculated with anthrax, controls being also inoculated with the same virus. We think our method of feeding the animals preferable to that adopted by MM. Fodor and Chor, as in every case the animals remained in perfect health till inoculated. The results were as follows:—

(a) Six guinea-pigs, fed with potassium chloride for periods varying from three to six weeks; three control animals fed in the ordinary manner. Inoculation with a virus (proved to be fatal to rabbits in three days) caused development of anthrax in all the animals, so that all died in from forty to forty-eight hours.

(b) Six guinea-pigs were fed with potassium chloride during two months; six control animals were fed in the usual way. Inoculation with a feebly virulent anthrax (Pasteur's second vaccine) proved fatal to all in from forty-four to seventy hours. Four of the prepared animals died before any of the controls.

(c) Two guinea-pigs, fed (with a short intermission) with potassium chloride for three months, and one control animal, were inoculated with the second vaccine anthrax. One of the prepared animals was moribund in forty-four hours, the other two being found dead next day. Typical cultures of anthrax were obtained from all the animals mentioned above.

The result of our experiments is that saturation of guinea-pigs with potassium chloride in no way confers immunity against anthrax—in fact, that in animals thus prepared death occurs more rapidly than in control animals. This result may be due either to a positive action of the potash itself or its having tended to cause elimination of other bases, such as sodium or calcium. We think it is just possible that if the food of Fodor's animals happened to contain a large proportion of potash salts, the comparative immunity produced in them by the injection of soda might be due, not to any

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positive action of the soda, but simply to its tending to displace a certain proportion of potassium from the body.

Our experiments upon the action of calcium, magnesium, and aluminium are now in progress, and we hope shortly to communicate the results of them.

THE ACTION OF SOME RECENT HYPNOTICS ON DIGESTION.

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HAVING observed that certain gastric disturbances such as distaste for food, flatulence, vomiting, and diarrhoea occasionally followed the exhibition of chloralamide, paraldehyde, urethane, and sulphonal, the following investigations were undertaken to elicit their action on digestion. For example, when sulphonal was given, and when vomiting occurred, it appeared that though the food had been in the stomach for several hours little digestion had taken place. Again, after the exhibition of paraldehyde there frequently followed diarrhoea.

These investigations, which, it must be observed, attempt to deal only with one of the phases of digestion, may help to throw some light on the action of the drugs on the ferment. It has to be remembered that they may have a further action on gastric secretion, and that the whole of the muscular and nervous mechanism of the stomach may be influenced directly or indirectly by them. At any rate, paraldehyde does not seem to interfere with digestion, because of its influence on the peptone-forming power of pepsin; for when employed both in large and small quantities, it distinctly accelerated the digestion of the fibrin.

To ascertain this, the method employed was that of Grützner, and consisted in preparing fresh fibrin from blood, which was carefully washed with cold water until the washings were free from blood colour; the washed fibrin was then allowed to stain in a weak ammoniated solution of carmine for twenty-four or thirty-six hours; the stained fibrin was again washed in a slowly-running stream of cold water till the washings were colourless. The rate and amount of digestion were estimated by the liberation of colour from the stained fibrin, and by its diminished bulk. Four test tubes of equal size and shape were selected; No. 1, which was the control test tube, as a rule contained $\frac{1}{2}$ gramme stained fibrin, 2 decigrammes pepsin porci, 2 cubic centimetres 2 per cent. hydrochloric acid, and 15 cubic centimetres of water. The other three test tubes contained, in addition to the preceding ingredients, varied and graduated quantities of the drug under observation. The fibrin was suspended in the test tubes either loosely tied by silk threads, or enclosed in small muslin bags. The set of test tubes were then placed in an incubator, the temperature of which was kept as nearly as possible to that of normal body heat. The liberation of colour and the bulk of fibrin were recorded from time to time. Morson's pepsin porci was used throughout. An acid solution of pepsin supplied by Barron, Harveys, and Co., London, was also employed to control the results obtained by Morson's pepsine.

Many series of experiments were made with each of the drugs, both in strong and weak solutions. To avoid repetition one experiment illustrative of the action of drug in a strong and in a weak solution is given.

Chloralamide: Strong Solution.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.075 gramme chloralamide.	Control plus 0.15 gramme chloralamide.	Control plus 0.3 gramme chloralamide.

Experiment was set going at 11.30 A.M.; at 1.30, two hours after, the following was noticed:

1.	2.	3.	4.
Slight liberation of colour.	Less liberation than 1.	No liberation.	No liberation.

At 3.30 P.M., four hours after, the following was observed:

1.	2.	3.	4.
Free liberation of colour and considerable digestion of fibrin.	Marked liberation of colour and active digestion of fibrin.	Less liberation of colour and digestion retarded.	Less liberation than 3, and digestion more retarded.

At 6 P.M., six hours and a half after, the following was observed:

1.	2.	3.	4.
Fibrin quite digested.	Fibrin quite digested.	Fibrin two-thirds digested.	Fibrin about half digested.

At 11.30 A.M., twenty-four hours after, the following was observed:

1.	2.	3.	4.
—	—	Fibrin nearly digested.	Fibrin two-thirds digested.

It being evident from experiments with strong solutions of chloralamide that digestion was retarded, it was then desired to ascertain what might be the results with weak solutions.

Chloralamide: Weak Solutions.

Test Tubes. Temperature of Incubator 36° C. to 40° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.01 gramme chloralamide.	Control plus 0.02 gramme chloralamide.	Control plus 0.03 gramme chloralamide.

In this and similar control experiments, it was found that up to 0.02 gramme there was not any evident change in the rate of digestion by the presence of chloralamide, but that when the strength of 0.03 gramme was used, retardation in the rate of digestion began. It was noticed that this retardation was in direct ratio with the strength of the solution of the drug.

The result of the experiments showed that:—

1. Large quantities retarded the digestion of fibrin in the ratio of the quantity employed.
2. Small quantities, for example, up to 0.02 gramme, did not have any marked influence either in accelerating or in delaying the digestion of fibrin.
3. Putrefaction was not retarded by either large or small quantities.

Paraldehyde: Strong Solution.

This being a volatile body, the test tubes, besides being plugged with cotton-wool, were capped with india-rubber to prevent evaporation.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.3 cc. paraldehyde.	Control plus 0.75 cc. paraldehyde.	Control plus 1.25 cc. paraldehyde.

Experiment was set going at 11.30 A.M.

At 1.30 P.M., two hours after, the following had taken place:—

1.	2.	3.	4.
Least liberation of colour and digestion.	Next advanced to No. 1.	More advanced than No. 2.	Distinctly more advanced than No. 3.

At 3.30 P.M., four hours after, the following was observed:

1.	2.	3.	4.
Still least action.	More active than No. 1.	More active than No. 2.	Still distinctly the most active.

At 5.30 P.M., nine hours after, the following was noticed:

1.	2.	3.	4.
Action distinctly delayed.	Action well advanced.	Digestion completed.	Digestion completed.

The result of numerous experiments showing that large quantities accelerated the digestion of fibrin, investigations to elicit the action of small quantities were undertaken.

Paraldehyde: Weak Solution.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.00075 cc. paraldehyde.	Control plus 0.0015 cc. paraldehyde.	Control plus 0.003 cc. paraldehyde.

The conclusion drawn from a number of experiments made with paraldehyde of similar strengths to the above was that its presence, even in minute doses, accelerated the digestion of the fibrin, and that the greater the amount of the paraldehyde present so much the quicker was the digestion of the fibrin.

The result of the experiments showed that:

- a. Large quantities considerably accelerated the digestion of fibrin, and that the rate of this acceleration was distinctly in ratio with the quantity used.
- b. Small quantities also increased, but to a less degree the digestion of fibrin.
- c. Putrefaction was presented by the larger quantities of paraldehyde, and was delayed by the smaller quantities.

Urethane.

The result of experiments which were conducted in similar manner showed that:

- a. Strong solutions, that is, 0.5 gramme, 0.25 gramme, 0.175 gramme delayed digestion; that the stronger the solution the greater was the delay.
- b. Weak solutions, that is, 1, 2, and 3 milligrammes, neither delayed nor accelerated digestion.
- c. Neither strong nor weak solutions retarded decomposition.

Sulphonal.

Similar conducted experiments showed that:

- a. Strong solutions, saturated or half saturated, consider-