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TRENDS IN NUTRITION*

BY

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The treatment of disease falls entirely within the sphere of the medical profession. There has consequently been little delay in applying the advances in our knowledge of nutrition to the treatment of deficiency diseases. But for the prevention of deficiency diseases we need a supply of protective foods sufficient for the needs of the whole population and at a price within the purchasing power of everybody. This involves economic and political problems which are regarded as being outside the sphere of medicine. There has for this reason been a greater delay in the prevention of deficiency diseases and the promotion of the higher standard of national health and physical fitness, which we now know can be attained by proper feeding, than in the advance of therapeutic dietetics.

Though progress has been slower in applying our new knowledge in preventive medicine a great deal has been attained in recent years by public health measures supplying milk, cod-liver oil, and other protective foods, free or at a cheap price, at child welfare centres, ante-natal clinics, and schools. These measures have helped to prevent the grosser forms of deficiency diseases among mothers and children of the poorer classes. One of the best features of this public health work is the closer supervision of health, with the earlier detection and treatment of diseases due to faulty diet.

In the present circumstances, when the whole nation is putting forth its maximum effort for victory, it is of the utmost importance that the entire population should receive a diet which will maintain the highest degree of health and fitness that can be attained by proper feeding. It is difficult to do this under war conditions. The valuable public health work which was rapidly eliminating the worst forms of deficiency diseases among the poor is liable to be to some extent dislocated, and the supply of certain of the more important protective foods, such as eggs and imported fruits, is decreasing. The newer knowledge of nutrition which is of practical value must be brought to bear upon the problem to enable us to get through the difficult war and post-war period not only without a worsening of the national diet but, if possible, with an acceleration of the rate of improvement in recent years.

This raises the question of what knowledge is of practical value. The science of nutrition has been advancing so rapidly that there is difficulty in judging what has been definitely established. There is much room for differences of opinion. In the leisurely times of peace,

discussion and dispute, followed by further investigations to clear up the points in dispute, form a normal and natural aspect of research effort. Under the present hectic conditions there is no time for discussion on minor points. We must take the information that is regarded by the majority of the profession as established and concentrate our efforts on getting it applied. It is of interest, therefore, to consider what knowledge can be regarded as of immediate practical value. The main questions are: To what extent does malnutrition exist or, in other words, to what extent could national health be improved by better feeding? What are the effects of malnutrition on national health and physique? In what respects are diets deficient and how can the deficiencies be made good from the food resources available? And, lastly: What bearing has the new knowledge of nutrition upon the national effort for victory and upon schemes for post-war reconstruction?

The Extent of Malnutrition

It is generally agreed that "deficiency diseases" are due to faulty diet. But there must obviously be many gradations of ill-health, from the highest state of health, which can be attained by perfect feeding, to conditions so gross that they are referred to as diseases. There is not complete agreement on the extent to which intermediate stages of deficiency diseases account for the rather vague and indefinite ill-health which is so prevalent. Attempts have been made to estimate this by various means, but we are not unanimous as to the validity of the methods of assessment of the state of nutrition used nor of the findings obtained by these methods. It will be of interest to consider these and see what can be regarded as being generally accepted.

Methods of assessing the State of Nutrition

Physiological and Chemical Tests.—Tests such as the hemeralopia test for deficiency of vitamin A, and chemical examination of body fluids to determine the phosphatase level or the degree of saturation with various vitamins and minerals, are giving interesting results. But the significance of certain of these tests is still in dispute. For example, some workers cannot find a close correlation between the results of hemeralopia tests and the intake of vitamin A or between the results of these tests and clinical signs of deficiency of this vitamin, and not all workers are agreed that saturation with ascorbic acid is necessary for perfect health. The increase of knowledge may bring about modifications in these tests and in the standards by which the results are judged. The principles on which such tests are based are sound and in the near future

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they will be generally accepted as valid. Those who have been carrying out research in this field, such as Harris and his co-workers at Cambridge, have done invaluable work. At the present stage, however, all that can be said with certainty about the results is that they indicate that the diet of a large proportion of the people in this country is not up to the optimum, and that in some cases it is so deficient that clinical signs of deficiency might be expected.

Clinical Assessment.—Clinical assessment presents difficulties because in minor degrees of deficiency there are few clear-cut clinical signs or symptoms which arise from specific deficiencies and from no other cause. Thus, for example, in minor degrees of deficiency of vitamin B₁, there is loss of appetite and there may be vague aches and pains of a rheumatic character, cardiac and intestinal derangements, and mental symptoms. All these, however, may arise from psychological or material causes other than deficiency of B₁. The same applies to a large extent to signs of deficiency of other vitamins or minerals. Clinical signs which are easily distinguished and characteristic of specific deficiencies occur only in the later stages of deficiency diseases and therefore are of limited value in estimating the extent to which minor degrees of malnutrition occur. When, however, a more detailed examination is made—as, for example, by x rays for rickets and estimation of haemoglobin for anaemia—many cases of subacute malnutrition are seen to exist in children who show no gross signs of ill-health.

In the past the clinical training of the medical student has not made him well fitted to recognize minor degrees of malnutrition. The clinical material for his training consisted of hospital patients who were nearly all in a rather advanced state of ill-health, and the student was too apt to classify the population into two categories—those so ill that they required medical treatment, and the rest of the population not seeking medical treatment, the average health of which was regarded as the normal. This standard of health is far below what we now regard as attainable. In some schools physiological and clinical teaching has begun with subjects of perfect health and physique with the idea of imparting a proper standard of health.

Dietary Surveys.—An estimate of the extent of malnutrition can be got by comparing the kind of diet in common use in different classes with the modern standard of requirements. If these standards be correct, then it may be assumed that the people on diets markedly below these standards are likely to suffer from malnutrition. There are three well-known standards—the British Medical Association diet at minimum cost; the “Stiebeling” diet at moderate cost, published by the U.S.A. Government Department of Home Economics; and the League of Nations diet, which is an optimum one irrespective of cost. Crawford has converted the B.M.A. diets into their nutrient constituents, allowance being made in accordance with the B.M.A. recommendation for one pint of milk daily for children from birth to 5 years, half a pint from 5 to 10, and a quarter of a pint for other persons. When the three diets are reduced to their nutrient constituents it is found that there is close agreement between them, the Stiebeling diet at moderate cost being a little more generous than the B.M.A. diet at minimum cost, and the League of Nations optimum diet a little better than the Stiebeling one. These standards were drawn up independently by different groups of experts, and can be accepted as fairly reliable indications of requirements. When diets in common use are compared with these standards it is found that the average intake of some minerals and most of the vitamins among poor families with children is low.

Feeding Tests.—If we accept as our definition of malnutrition a condition which can be improved by improving the diet, then the surest method of estimating malnutrition is to do feeding tests. The results of tests such as those in which additional milk was given to school children, and the experiment with the modified Oslo breakfast done by Borland in 1938, show that the average degree of health, which is often taken as the normal, can definitely be improved in a large proportion of these children. The marked improvement in health and physique of young recruits on joining the Army is undoubtedly largely due to better feeding.

In the last twenty-five years the average consumption of protective foods in this country has increased by roughly about 50%, and there has been a corresponding remarkable improvement in national health, shown by the great reduction in deficiency diseases due entirely to better feeding, by the reduction in infant mortality rates and tuberculosis death rates, and by the improvement in health and rate of growth of children, which can be attributed largely to the same cause. Although there has been such an improvement the results of recent tests indicate that we have not yet reached the limits, or, in other words, there is still ill-health and poor physique which could be eliminated by dietary measures.

All these different methods of assessing the state of nutrition show the same general results. Physiological and biochemical tests indicate that the diet of a large proportion of our children is not up to the optimum. Clinical examinations, such as that made by the Board of Education on rickets in London and Dr. Spence's examination of Newcastle pre-school children, disclose a considerable amount of malnutrition. A comparison of the diets in use with recognized standards shows that large numbers of the population do not receive a diet up to the standards which we now regard as being necessary for health; and, finally, feeding tests with children reveal that improvement of the diet is followed by a corresponding improvement in health. Even allowing for the fact that none of these methods of assessment is absolutely reliable, there can be little doubt about the conclusion, since the same general result is obtained independently by each method. The time is not opportune for discussing what proportion of the population is below the standard of health which we now know can be attained by proper feeding. It is sufficient for our purpose if there is general agreement that there are substantial numbers whose health and physique can be improved.

Effects of Malnutrition : Primary

The primary effects of malnutrition as seen in the deficiency diseases are well known. Only one—the effect on working efficiency, which is of special importance at the present time—need be referred to here. The improvement of the diet of workmen whose diet was not previously up to the standard for health is followed by increased output without any conscious increased effort and also by a reduction in the number of accidents. Many factories are now providing a meal for employees. It is likely that, as part of the national effort for increased output of war material, the provision of a meal will be made compulsory in all factories and measures be taken to ensure that the meal is on the lines of the Oslo breakfast, which will make good the deficiencies of the portion of the diet eaten at home.

Secondary

(a) *Infection.*—It is only in recent years that systematic research has been done on the influence of nutrition on susceptibility to infectious disease. About fifteen years ago the subject was investigated by a group of workers

associated with the Rowett Institute, including Prof. Mackie of Edinburgh and the late Prof. J. J. R. McLeod. In experiments with farm animals it was found that certain immunological reactions were considerably affected by the nature of the ration. In direct feeding experiments with rats, in which an infection was introduced into groups of the animals fed differently, it was found that with some infections, though not all, the mortality rate among those on a deficient diet was markedly higher than among those on an adequate diet. The results of these tests are complicated by acquired immunity. It is exceedingly difficult to get large groups of animals completely free from any previous infection which may complicate the results. That condition, however, has been obtained in Professor Topley's department at the London School of Hygiene and Tropical Medicine. His workers found that susceptibility to some infections is affected by diet. Thus, for example, well-fed mice are less susceptible to enteric than comparable animals on a poor diet.

These researches confirm clinical findings such as the increased susceptibility to infections of the cornea in deficiency of vitamin A, the frequent occurrence of bronchopneumonia in children suffering from rickets, and the effect of feeding on tuberculosis. While our knowledge of the effect of diet on immunity to infection is still very limited there can be little doubt that well-fed people are less susceptible to some infections, at least, than ill-fed people, and that the sequelae to many infections such as measles are likely to be more severe in children on a deficient diet.

This is a subject of considerable importance at the present time, when there is a displacement of the population. Endemic diseases in communities which have acquired immunity are apt to be spread to other sections of the population with little or no immunity. In addition to sanitary methods, and widespread immunization in the case of diseases where this method can be effectively employed, there is urgent need to increase the resistance of the people by improving their state of nutrition.

(b) *Psychological*.—An aspect of this subject which has so far received little attention is the psychological effect of malnutrition. This is especially marked in those suffering from pellagra, a proportion of whom end up in asylums. Vitamin B₃ deficiency in adults is accompanied by apathy and despondency, and in infants a typical symptom is the whining, whimpering, pathetic cry. A low blood calcium is accompanied by hyperexcitability. Women suffering from nutrition anaemia are usually apathetic, peevish, and easily discouraged. It is doubtful whether there is any physical symptom of malnutrition which is not accompanied by a psychological symptom.

This aspect of malnutrition is now receiving a good deal of attention by educationists. The number of dull or backward children, according to Segar, varies from about 1% among well-to-do families to 20% amongst the poorest families. Many intelligence tests have been used in an attempt to ascertain whether there is a correlation between nutrition and intelligence. As mental ability is an inherited characteristic it is doubtful whether the results of such tests, from one point of view, are of much value. The power to use intelligence, however, depends upon the state of health. A badly fed child suffers from early onset of fatigue and lack of power of concentration, and consequently is slower to learn. In some tests it has been found that supplementary feeding of milk and other protective foods has been followed by a definite improvement in the ability of the child to learn lessons. In a test which covered a period of five months the educational advance in that period was equivalent to the advance normally made by these children in two years. It is estimated that

out of between five and six million school children five hundred thousand are dull or backward. While it may be going too far to label these children not mentally deficient but nutritionally deficient, as has been done by one American investigator, there seems little doubt that the number would be drastically reduced if their diets were made adequate. There is some apprehension at the wartime interference with the education of our children. If means were taken to ensure that every child was properly fed it is probable that the interference with the normal educational machine would be compensated for by the greater physical and mental vigour of the children.

In the present circumstances, when all sections of the community are being subjected to the emotional strains of war conditions, this aspect of nutrition assumes great national importance, both for adults, whose working efficiency and morale must be maintained at the highest possible level, and for the children, who when they grow up will need all their physical and mental powers to clear away the wreckage of the present war and build the new and better post-war world for which we are all hoping.

Characteristics of Deficient Diets

So much work has been done and so much written about the effects of deficiencies of the different vitamins or minerals that we are apt to think that improvement of the diet consists in making good these individual deficiencies. In the treatment of gross deficiency diseases vitamin concentrates are useful. They are of less value, however, in dealing with minor degrees of malnutrition, because poor diets are deficient not in one but in many constituents, and if the intake of one be increased the intake of some other immediately becomes the limiting factor for health. What we are dealing with is not diets deficient in one or two constituents but diets deficient in many. In tests the improvement got by giving one nutrient, such as vitamin A, is negligible compared with the improvement obtained by giving milk, which is rich in most of the elements deficient in a poor diet. This is well exemplified in the case of teeth. Deficiencies of vitamins D, A, and C, of calcium, and of magnesium; the effect of carbohydrates in promoting the growth of *B. acidophilus odontolyticus*, which attacks the enamel; mechanical chewing, which affects the growth of the jaws and the tooth-spacing, all help to determine the condition of the teeth. But the correction of any one of these factors will not ensure healthy teeth. Schiötz found in his extensive investigations that of children who had perfect teeth some had had cod-liver oil, some had not; some had been given sweets, some had been kept off sweets; some had brushed their teeth and some had not. But every child who had perfect teeth had had an abundance of milk and green vegetables regularly, without a break. These together supply all the known factors needed for healthy teeth, and possibly also as yet unknown factors. It has been decided to put vitamin B₁ and calcium into white bread. This will certainly to some extent improve diets deficient in these substances, but Harriette Chick's experiments have shown that white bread plus B₁ and calcium is by no means equivalent to wholemeal bread, which contains, in addition to these factors, several others which are equally important.

In planning for a perfect diet we should depend not so much on attempts to provide a sufficient amount of any specific nutrient as on ensuring that the intake of the protective foods is ample. We do not yet know all the dietary constituents which are essential for health, but we do know that a sufficiency of the protective foods will supply everything which the body needs. Fortunately,

everything can be supplied by a few foods—e.g., milk, green vegetables, wholemeal bread, and potatoes. These, taken together in sufficient quantity, would meet all bodily needs for specific constituents.

This is of importance at the present time, when the supply of some of our foods, such as eggs and imported fruit, will be reduced. This country can produce enough milk, vegetables, and potatoes to meet the needs of the whole population, and there is no insurmountable difficulty in making wholemeal bread available. The change over to increased consumption of these protective foods will involve an alteration in dietary habits. The chief change needed for health is to bring the consumption of milk and vegetables among the poor up to what it is among the well-to-do. At a time when all classes are prepared to make sacrifices there should be no difficulty in getting people so to adjust their diets as to increase the consumption of those foodstuffs which can be made available in sufficient amounts, especially as the main feature of the adjustment would be a levelling up of the diet of the poor by increased consumption of protective foods which we can produce at home, and the limitation, without necessary deterioration, of the diet of the well-to-do by reduced consumption of less essential foods.

Even though our agricultural policy were adjusted to provide milk, vegetables, and potatoes in amounts sufficient for the whole population there remains the problem of making them available at a price within the purchasing power of everybody. The Ministry of Food is engaged on a great educational campaign on the nature of body-building foods, protective foods, and energy-yielding foods. The value of this campaign would be greatly increased if specimen diets were given for families with three, four, or five children, and the price of the food stated, showing that families of low-wage earners, unemployed, and men in the Fighting Services could purchase these diets with the income available for food. The Canadian Medical Association has published an excellent booklet showing the kind of diet needed for different families and the cost, and has thereby adjusted propaganda to economic realities.

Nutrition only One Factor needed for Health

Such spectacular results have been obtained in the treatment and prevention of disease by dietary measures that there may be a danger, especially on the part of those working on the subject, of forgetting the importance of other factors. Bad housing and overcrowding, which facilitate the spread of infectious disease; the psychological effects of overcrowding; and the feeling of frustration, worry, and anxiety, and of impotence in the face of environmental difficulties common among the poor, are probably as potent causes of ill-health as faulty diet. These factors will react on one another and reinforce each other. Until they have been eliminated we will not be able to attain the high standard of national health and physical fitness which we know can be attained. They all tend to be associated with poverty.

In the last hundred years the medical profession has developed great resources for the treatment of diseases arising under these conditions. It is now recognized that the duties and responsibilities of the profession must be extended to include the prevention of disease and, further, the promotion of health. When we enter this sphere we are faced with the environmental conditions which affect health and with the associated social, economic, and political factors. The Report of the British Medical Association Committee on Nutrition, and the "Aylesbury Broadside," published by the *Lancet*, show that the profession has the vision and the courage to take cognizance of these factors. The profession must extend its work

in this new sphere if it is to play a part commensurate with its great influence and prestige in building up the new and better world for which all men are hoping.

Medicine and the New World Order

The different ideologies which are in conflict promise a new world order. In our own country Mr. Bevin has said that after the war the miseries of poverty will be relegated to the limbo of the past, and Mr. Churchill has declared that we shall go forward in "the march of the common people towards their just and true inheritance and towards the broader and fuller life." Groups of economists and others are already planning, and indeed the Government has recently set up a special department to work out schemes for post-war development.

But we cannot with safety leave the planning of the future to political parties. As the *Times* in a leading article on a speech of President Roosevelt's says, "The gravest danger to democracy lay in the growth in some quarters of a cynical belief that the attitude to the all-important party machines was determined less by the voters than by the economic interests of those who provided the party funds." Nor can we leave it to the economist, who is too apt to think that prosperity consists of a trade boom. The miseries of the slums and the poverty created during the tremendous industrial and trade prosperity of the nineteenth century have convinced all thinking people that trade prosperity and the welfare of the working classes are not necessarily correlated. We must plan for the satisfaction of human needs as well as for trade prosperity.

The medical profession contains within it experts on every subject that affects human welfare. It is the only organized group of men competent to make a statement on human needs. The first essential need for a fuller life for the common people is the provision of environmental conditions which will enable them to attain their fullest inherited capacity for physiological and mental well-being. The British Medical Association might well set up a committee to report on the minimum material and psychological needs for full physiological and mental well-being. It could then, with the authority of the whole profession, recommend that in post-war planning effort should be directed first and foremost to the satisfaction of those needs for the whole population.

Some needs, such as better housing, cannot be dealt with during the war, but others, such as the provision of an adequate diet for everybody, could be met even during the war if we had an agricultural and food policy based solely on the nutritional requirements of the people. If this, the most fundamental need, were met, at the end of the war, even though we were poorer in other respects, we would have taken the first and most important step in the march of the common people to the fuller life, and the provision of plans for meeting other needs would give enthusiasm to continue the march and also confidence that we were travelling in the right direction.

Unfortunately, in the past, as Dr. R. W. L. Ward has pointed out in a recent letter to the *Journal*, the profession has been too much occupied with its own remuneration and failed to recognize its responsibilities towards the bigger issues of national life. At the present time, when the artisan trade unions are surrendering rights and privileges which have been won after such arduous struggles and are throwing the whole weight of their influence into the prosecution of the war in the hope of obtaining a new and better order, the medical profession must do its utmost to ensure that the better order which will compensate for all the sacrifices of the war will in fact materialize. It should assume that it is the custodian of

the health of the people and that it is its duty to define the environmental conditions necessary for the higher state of health which medical science considers can be attained. There is not the slightest doubt that the brave words of Churchill and Bevin are spoken in earnest and that they and other national leaders who are anxious to reorganize our social and economic system for the benefit of the common people would welcome an authoritative statement from the medical profession on the kind of conditions we should plan for. If the profession is willing to make its full contribution to the national effort for victory and for the equally important post-war reconstruction it should begin to do so now.

A CASE OF PULMONARY CONCUSSION ("BLAST") DUE TO HIGH EXPLOSIVE

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It is now well recognized that a proportion of individuals who are exposed to the detonation of high explosive develop pulmonary haemorrhages without any significant injury to the thoracic wall. The number of recorded cases in which such patients have been closely observed and have subsequently died is still quite small. Such a case is recorded below.

Case Report

In November, 1940, a bomb fell on a wooden hut in which the patient, a soldier aged 23, was asleep. No details are available of the immediate effects of the explosion or of the condition of the patient at this time except that he was given morphine 1/4 grain at 4.40 and 1/3 grain at 5.20 and 3,000 units of anti-tetanus serum at 5.30, when he was transferred to hospital.

On admission he was "shocked," dyspnoeic, and cyanosed, and rales could be heard scattered throughout the chest. He had pain in the chest and abdomen and vomited some blood-stained fluid. The abdomen was tender and rigid. The temperature was 100°, and the pulse rate 130 and the respiratory rate 30 per minute. He was given heroin grain 1/12 and atropine grain 1/100, and oxygen was administered. His condition gradually improved. On the morning after admission tubular breathing with an impaired percussion note was found at the left base, but the scattered rales were less conspicuous. A radiograph of the chest showed a diffuse, mottled, woolly shadow throughout the left lung. On the right side there was a similar shadow in the mid-zone and extending out to the periphery from the hilus. The abdomen was still tender and vomiting continued. The temperature was 98.6°, and the pulse rate 120 and the respiratory rate 24 per minute.

It was decided in consultation that the patient should be sent to another hospital, and he was first seen by us thirty-nine hours after the explosion. He was restless and looked ill with high colour and slight cyanosis. There was considerable dyspnoea, with dilatation of the alae nasi on inspiration, but no orthopnoea. He was extremely irritable and resentful of interference, drinking greedily but vomiting large amounts of thin brownish watery fluid which gave a faintly positive guaiacum reaction. His temperature was 99.6°; the pulse rate was 120 and respirations 36 per minute. The tongue was dry and furred. Blood pressure was 126/76. There was generalized tenderness, which made accurate percussion and examination of the back of the chest inadvisable.

Movement was diminished on the left side and the breath sounds were obscured by loud rhonchi and scattered coarse rales. The abdomen was distended with flatus and the abdominal wall was rigid and tender. An acute intra-abdominal lesion was suspected, although there was no dullness in the flanks, the liver dullness was not impaired, and bowel sounds were audible. Attempts were made to administer oxygen by means of a B.L.B. mask and spectacle frame, but the patient resisted and would tolerate neither. At 8.30 p.m. his general condition appeared unchanged, although the pulse rate had risen to 140 per minute and there was some congestion of the veins in the neck. His blood pressure was 136/84 and the haemoglobin 125% (Hellige colorimeter).

At this time the indications for treatment seemed somewhat confusing. The furred and dry tongue, the haemoglobin percentage of 125, and the rapid rate of the pulse suggested that plasma should be given. On the other hand, the height of the blood pressure, the distended veins in the neck, the bubbling rales in the chest, and the general appearance of the patient strongly suggested that a venesection should be performed. We decided to do neither, hoping this was a transient crisis precipitated by the journey from the first hospital. As the patient was quiet if left undisturbed, morphine was withheld and he was closely watched. At 11 p.m. it was obvious that his condition was deteriorating. He developed a distressing hiccup, the bubbling rales in his chest could be heard at the end of the bed, his cyanosis was increasing, and the veins in his neck were distended up to the angle of the jaw. The temperature was 102.2°, the pulse rate 144, and the respiration 48. Morphine grain 1/6 was given, but the condition of the patient began to deteriorate even more rapidly. 600 c.cm. of blood was then withdrawn, and this was followed by spectacular improvement. The bubbling rales in the chest rapidly diminished; the patient was quieter, was less restless, and was breathing more easily, and he fell into a light sleep. His blood pressure was not measured lest it disturb him, but the quality of his pulse suggested that it was being maintained at its previous level.

At 5.30 a.m. the patient became much worse and was restless and delirious. The rate of the pulse was 140 per minute, and its volume was poor; there was a systolic blood pressure of 44 mm. Hg. but no congestion of the veins in the neck. The respiratory rate again increased to 40 per minute, but no rales could be heard in the chest anteriorly except in the left axilla. The haemoglobin was 100%. Oxygen was administered with a B.L.B. mask and, as no plasma was immediately available, a transfusion of blood was begun. After the patient had received one-third of a pint clotting occurred. He was then moribund, and died at 7 a.m.

In a sample of blood taken at 11 p.m. the blood urea was 86 mg. per 100 c.cm. and the alkali reserve 60.5 c.cm. per 100 c.cm. plasma.

Post-mortem Examination

The body showed no external signs of injury except a small superficial abrasion on the bridge of the nose. The upper air passages were normal except that they contained a moderate amount of lightly blood-stained thin and frothy mucous fluid. The pericardial fluid was lightly blood-tinged. There were some petechial haemorrhages between the parietal pleura and the thoracic wall and a few larger haemorrhagic areas up to the diameter of a five-shilling piece in size. These were composed of thin laminae of dark blood and were not associated with any recognizable fracture of the ribs or trauma of the thoracic parietes. There was no excess of fluid in the pleural sacs.

Both lungs were large. At least two-thirds of the bulk of the left and about half the bulk of the right lung were consolidated. The visceral pleura showed no laceration, but there were several extensive dark irregular haemorrhagic areas beneath the pleura of both lungs, chiefly disposed about the posterior and basal regions; the largest was roughly rectangular, and measured about 6 by 5 cm. All these lesions were subsequently shown to be continuous, with large foci of deeply seated resolving haemorrhage.

Most of the consolidation in the left lung was basal, posterior, and deeply placed, but there were solid areas deep in