Seeing that proliferation of cells plays the important part in tumour formation, it is natural to ask whether it is possible to hinder the proliferation by any process of starvation. Starvation might be induced, either by a general reduction of the nutriment supplied to the body, or by a local cutting off of the nutriment such as is effected by ligature of the arteries which supply the tumour with blood. We should not expect much from the first method, since the other tissues would be equally affected by the deficiency of nutriment. The second method has been tried in some cases of inoperable carcinoma with the effect of temporarily diminishing the rate of growth.

I have previously referred to the presence of large quantities of glycogen in tumours, especially in those which are malignant. This glycogen is found wherever active proliferation is taking place and it supplies the energy necessary for the proliferation. The question arises, therefore, whether we can control this supply in any way. In glycosuria we know that the carbohydrates excreted in the urine may be derived either from the ingested carbohydrates or from the proteids of the body. The origin of the glycogen in tumours has not been investigated so fully, but probably the same two sources are available as in diabetes. An examination of the quantity of nitrogen excreted in the urine would be of assistance in determining this point, but I am not aware of any systematic investigations in this direction. The urine in malignant disease has not received the attention that it deserves. The presence of wasting and cachexia would seem to show that the proteids of the body are broken up and it is very likely that the glycogen arises, in part at least, from this destruction of proteid matter. If this is the case we cannot expect much from a carbohydrate-free diet, since the body proteids would still remain as a source of the glycogen. Is it possible, then, to remove the glycogen which has been formed? We know that malignant disease is very rarely met with in association with diabetes, and we also know that in acute diabetes wounds heal with great difficulty. The explanation of this is probably that the glycogen which is necessary for the proliferation of cells is continuously being removed from the body as glucose. It is permissible, then, to think that by setting up an artificial glycosuria we could remove the glycogen as fast as it is formed and so prevent it being available for supplying the energy necessary for the proliferation of the tumour cells. Such a glycosuria may be set up by means of certain drugs—such as phloridzin. This is a point which might well be investigated by therapeutists. I am afraid, however, that we must not expect much from such a treatment because the drug would remove the glycogen from the normal tissues as well as from the abnormal, and it would be of little use to hinder the progress of a tumour if the surrounding tissues were not able to take advantage of the occasion by reacting and absorbing it. Much depends on the question whether the normal or the abnormal tissues would yield up their glycogen most readily.

The most important question at the present time with regard to malignant disease is whether anything can be done to prevent or to retard recurrence and metastasis and to benefit inoperable cases. As I have pointed out, tumours are essentially due to intrinsic causal factors, and any treatment should, therefore, be directed towards these factors. The cases described by Sir William Bennett, to which I have referred, and numerous other recorded cases, show that malignant disease does not always proceed to a fatal termination but may become arrested and even cured. To facilitate this course measures should be taken which would raise the enfeebled resistance of the body tissues. In this connexion I may mention that arsenic, which has a markedly tonic action, has been recommended in all diseases characterised by the progressive processes and in some cases with some degree of success. At a recent meeting of the French Académie de Médecine Dr. Lucien le Roy³ gave an account of a case of cancer of the lung in which the patient apparently recovered after treatment with arsenic and quinine. The details of this case are not yet published. Coley's fluid probably acts in the same way by producing an increased reaction of the surrounding tissue against the tumour and the same may, perhaps, be said of such procedures as oöphorectomy and feeding with thyroid extract. This last mode of treatment has been recently reviewed by Mr. H. T.

Butlin⁴ who comes to the conclusion that the benefit derived from it is only temporary.

The immense improvement which has taken place in the treatment of tuberculosis points the way to a similar procedure in malignant disease. This hygienic treatment acts by increasing the resistance of the body tissues to the encroachments of the tubercle bacilli and I think that it is worth while to consider whether by a similar mode of treatment, the body tissues could be encouraged to resist with greater force the encroachments of the tumour cells. I am inclined to think that if a patient from whom a malignant tumour has been removed, instead of returning to a sedentary and unhealthy mode of life, were to lead an active outdoor existence in a healthy climate with sufficient exercise and good plain food, leading as natural a life as possible, there would be less tendency for the disease to recur, and it is possible that a tumour, already present, might under these circumstances show a slower rate of growth or might even undergo a diminution.

And now, Mr. President and Gentlemen, my task is ended. I have laid before you no new hypothesis, nor have I brought forward any startling experimental results. I have endeavoured to bring to your notice the facts, mostly well known to you, concerning the process of tumour formation and to show what conclusions we can legitimately draw from these facts, and I have tried to point out to what modes of treatment these conclusions lead. Finally, I would urge that the investigation of the pathology of malignant disease should not be left altogether to the bacteriologist. Histologists, pathological chemists, clinicians, and therapeutists should all take part, for much remains to be discovered in all these branches of medical research. There is especially a great field for work in the study of the clinical characters of malignant disease such as the temperature, the urine, and the phenomena of cachexia. There is too much tendency at the present day to regard micro-organisms as everything in the causation of disease and to neglect the personal or intrinsic factors. I would also urge that the investigation should not be confined to the malignant tumours alone, but should include other tumours and those processes which are allied to tumour formation. It is only in this way that we can hope to arrive at any final conclusion as to the pathology of tumour formation.

THE HOSPITAL SHIPS OF THE METROPOLITAN ASYLUMS BOARD AND THE DISSEMINATION OF SMALL-POX.

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THE excessive prevalence of small-pox in the Orsett Union has for many years been notorious in the county of Essex. Investigations made during the years 1892–95 led me to conclude that the sole cause of this excessive prevalence was the proximity of the small-pox ships of the Metropolitan Asylums Board. This was also the popular view. From 1895 until the autumn of last year the county of Essex and the metropolis remained almost free from the disease. During the quarter ending June 30th, 1901, only six cases were notified in London, but soon after there was a marked increase resulting in 272 cases being notified during the third quarter. As soon as this tendency to spread manifested itself and the number of cases of small-pox in the ships increased, the opinion was openly expressed that an outbreak would speedily occur in the Orsett district and that as usual it would commence in Purfleet. By the middle of September a few cases had occurred and since then cases have followed in rapid succession, until now (Feb. 1st, 1902) about one-tenth of the whole population in Purfleet has been attacked. This outbreak soon spread to the town of Grays and to adjoining parishes, and is gradually extending into all parts of the county. The expense already incurred in providing accommodation for the patients is very considerable and in the Orsett Rural District it is almost ruinous. The subject, therefore, is of very great importance to the county.

The small-pox ships were anchored opposite Purfleet early

³ Brit. Med. Jour., Jan. 25th, 1902.

⁴ Ibid., Jan. 4th, 1902.

FIG. 1.

Map showing the position of the hospital ships in the Thames in relation to Purfleet and West Thurrock. The dotted line includes Purfleet.

in 1884. Prior to this time I cannot ascertain that there was any unusual incidence of small-pox in this hamlet, but, as the following figures show, the disease was more prevalent, as indicated by the death-rate, in the Orsett Union than in other parts of Essex. This is probably due to the fact that vaccination has until recently been very lax throughout the union.

TABLE I.—Deaths from Small-pox in the Orsett Union and in the Remainder of the County of Essex.

	Orsett Union.	Remainder of the county.
Number of deaths from small-pox, } 1871-1883 inclusive	25	389
Annual death-rate per 1000	0·117	0·089
Number of deaths, 1884-1900 in- } clusive	33	116
Annual death-rate per 1000	0·072	0·014

It will be seen that since 1884, when the floating hospital was placed in the Thames, the deaths in the Orsett Union from small-pox have proportionately greatly increased. The ratio which in the first period was 4 to 3 has since been 5 to 1. To what is this change attributable if not to the proximity of the ships?

The accompanying map shows the position of the floating hospital in the Thames, relatively to Purfleet and West Thurrock parish in the Orsett Union. Within the half-mile radius of the ships there are only about four cottages on the Essex

TABLE II.—Relative Prevalence of Small-pox in certain Districts of the County of Essex.

	Number of cases.	Proportion relatively to population, Purfleet being taken as 100.
Purfleet	15	100·0
West Thurrock (whole of)	35	46·0
Orsett Union without West Thurrock	48	7·0
Essex County without Orsett Union	658	3·5

side of the river, whilst the three-quarter mile radius includes all the hamlet of Purfleet which is a portion of the parish of West Thurrock. Beyond this limit the only groups of houses are in West Thurrock on the road to Grays. At Purfleet there are paper-mills, oil-stores, &c., employing many hands, some of whom reside at Grays. In investigating the cases

which occurred during 1892-95 there was no evidence of infection from these works or from the rubbish-tip used by a London vestry. During these years 15 cases occurred in the Purfleet area, 28 in the remainder of the West Thurrock parish, and 52 in the rest of the union. The relative prevalence is given in Table II.

Within the three-quarter mile radius from the ships cases were twice as numerous in proportion to the population as in the whole of the parish of West Thurrock, 14 times as many as in the remainder of the union, and 30 times as numerous as in the remainder of the administrative county. In other words, the further the district from the ships the less the number of cases. The aerial conveyance of infective material alone appears to account for this excessive prevalence.

TABLE III.—Progress of Small-pox in the County of Essex for the period extending from August, 1901, to January, 1902.

	Population.	1901.					1902.	Total.
		August.	September.	October.	November.	December.	January.	
Barking	21,547	0	0	0	2	2	11	16
Chingford	4,372	0	0	0	2	0	0	2
Colchester	38,350	0	0	0	1	0	1	2
East Ham... ..	95,990	0	0	3	16	11	21	51
Grays	13,831	1	2	0	3	32	55	93
Leyton	98,900	0	0	1	2	3	7	13
Leigh... ..	3,663	0	0	0	0	0	1	1
Maldon	5,564	0	0	0	0	1	0	1
Romford	13 656	0	0	1	1	6	22	30
Shoebury	4,081	0	0	0	0	1	0	1
Scuthend... ..	28,857	0	0	0	0	1	0	1
Walthamstow... ..	95,125	0	2	0	0	1	16	19
Woodford... ..	13,806	0	0	0	0	1	0	1
Other urban districts	138,000	0	0	0	0	0	0	0
Billericay Rural District	17,504	0	0	0	0	0	1	1
Chelmsford Rural District... ..	23,717	0	0	0	0	0	2	2
Halstead Rural District	10,176	0	0	0	0	1	0	1
Maldon Rural District	14,630	0	0	0	0	0	1	1
Orsett Rural District	19,890	0	8	9	33	73	74	197
Rochford Rural District	14,512	0	0	0	0	1	3	4
Romford Rural District	19,015	0	0	0	0	5	13	18
Other rural districts	121,310	0	0	0	0	0	0	0
Totals... ..	--	1	12	14	60	139	228	454

The present epidemic has afforded me an opportunity of studying more carefully the effect of the floating hospital. The earliest case of small-pox recorded in the county last year was that of a man employed during the day at Purfleet but residing at Grays; this was in the last week in August. The progress of the disease in the county since is shown in Table III.

Grays Urban District forms part of the Orsett Union. The number of cases in this union is therefore 290, the population being 33,721; in the remainder of the county in which cases of small-pox have occurred there have been 162 in a population of 523,465, or taking the whole county save the Orsett Union 162 cases in a population of 782,700. Therefore, the cases per 1000 of the population in the Orsett Union were 8·6, while those in the remainder of the county were 0·21 per 1000. In proportion to the population there have been 40 times as many cases in the Orsett Union as in the remainder of the county.

The only centre of population within a mile of the hospital ships being the hamlet of Purfleet and the nearest parish being West Thurrock we should naturally expect these portions to have suffered most severely if the ships are the foci of infection. That this is the case can be demonstrated in a most conclusive manner.

Up to Feb. 1st there had been 290 cases of small-pox in the Orsett Union; 42 of these occurred in the hamlet of Purfleet within the three-quarter mile radius shown on the map, 50 in the remaining portion of the West Thurrock parish, and 198 in the other parishes of the union. In the following table the relative incidence of the disease in these districts is given, calculated on the basis of the last census returns and upon a census of the population made for the purpose by my assistant, Mr. G. Sowden:—

TABLE IV.—Incidence of Small-pox in the Districts of Purfleet, the Remainder of West Thurrock, and the Remainder of the Orsett Union.

	Purfleet hamlet.	Remainder of West Thurrock.	Remainder of Orsett Union.
Population	479	2106	30,578
Cases of small-pox	42	50	87
Rates per 1000 of the population... ..	88	24	2·8

It will be seen that nearly four times as many cases (in proportion to the population) have occurred in Purfleet as in the remainder of West Thurrock and 30 times as many as in the rest of the Orsett Union, notwithstanding the epidemic prevalent in Grays. The next table, showing the condition of the population with reference to vaccination, proves that there is nothing in this to account for the extensive and persistent character of the outbreak.

TABLE V.—Statistics of Vaccination in Purfleet.

	Vaccination in infancy only.	Vaccination in infancy and since revaccinated.	Not vaccinated but had small-pox.	Neither vaccinated nor had small-pox.	Total.
Adults ...	111	171	8	4	294
Children 12 years of age and under ...	70	106	2	7	185

Moreover, the Orsett Rural District and the Grays Urban District possess a joint hospital (some miles from Purfleet) which was promptly used for the reception of patients. From my own observations I am convinced that more was done in this district than is usually done in such districts for preventing the spread of the disease, but these efforts have been futile since the focus from which the disease is being spread still remains.

There is only one other parish in the Orsett Union which is near the hospital ships. This is Aveley with a population of 1061. During the period under consideration 22 cases

have occurred in this parish, or 11·3 per 1000 of the population—a further confirmation of the air-borne character of the infection

Wind rose, August 18th, 1901, to Jan. 31st, 1902, showing prevalence of south-westerly winds.

Still more cogent proof, however, is obtained when the relation between the prevalent wind and the distribution of the disease is considered. The wind rose shows that by far the most prevalent wind has been from south-west and west-south-west and would therefore blow over that portion of Purfleet to the south of the railway. (See map.) Between the cottages here and those to the west of the railway there is a considerable area upon which there are very few houses. To the west of the railway there is a group of 32 houses lying almost due north of the ships. On very few occasions has the wind blown in this direction, hence if the infection is air-borne the inhabitants of this portion of Purfleet should have almost escaped. This is exactly what is found. In West Purfleet, with a population of 137, there has been only one case, whilst in South Purfleet, with a population of 342, there have been 41 cases. The attacks in West Purfleet were 0·8 per 100, while in South Purfleet they were 12·0 per 100. In other words, in the cottages nearest and exposed to the prevailing wind out of every eight persons one has been attacked. If such an epidemic prevalence had occurred in London there would have been over half a million cases during the past seven months.

In connexion with this outbreak in Purfleet it is interesting to note that out of the adult population, containing 12 who had not been vaccinated prior to the commencement of the epidemic, eight persons had had small-pox, and three have contracted the disease during the epidemic. Amongst the children were nine who were unvaccinated; one had had small-pox some two years ago, two were too young to be vaccinated, and of the remaining six five have since contracted small-pox. Taking both adults and children (excluding the two infants) there were 19 unvaccinated persons, of whom nine had had the disease before the epidemic, leaving 10 who had neither been vaccinated nor had had small-pox. Of these eight, or 80 per cent., have contracted the disease during the past seven months.

When cases were occurring in Purfleet in 1895 and the attention of the Metropolitan Asylums Board was directed to this fact the opinion was expressed that this was due to the proximity of the ships. It was then suggested, however, that the infection was spread by personal contact with visitors and others passing to and from the ships. This intercourse was stopped and for years past, I am informed, there has been no intercourse whatever between the ships and the Essex shore. Any infection, therefore, from the ships must have been air-borne.

Besides the cases referred to of residents in West Thurrock I have notes of 15 others, persons engaged in works there but residing in Grays, Aveley, and Rainham. The last-named parish is in the Romford Rural District but is within a four-mile radius of the ships to the north-west.

It is exceedingly difficult to ascertain to what distance the infection may be carried by the air, but my impression is that in the direction of the wind it may be carried two, or possibly three, miles. I doubt very much whether the influence extends as far as Grays which lies from three to

four and a half miles from the ships. The disease once introduced into West Thurrock is carried by the men engaged at the cement and other works into Grays and other parishes. It has been surmised that the enormous volume of infected sewage poured into the river from the ships may explain the incidence of the disease in the parishes adjoining the river. Of this there is at present no proof. The evidence usually adduced is based on the fact that several men who have contracted the disease had been accustomed to bathe in the river. I am decidedly of opinion, however, that this sewage should be treated in some way before it is allowed to flow into the Thames.

I desire to express my indebtedness to my assistant, Mr. Sowden, who has collected for me a large mass of information with reference to small-pox prevalence in the Orsett Union, a portion only of which has been utilised in the present paper.

Chelmsford.

ON CLEFT PALATE.

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CHILDREN, GREAT ORMOND-STREET.
(Concluded from p. 438.)

FROM the consideration of the facts narrated in the previous article the indications for the treatment of the sufferers from cleft palate seem to me to be clearly as follows. First, we must endeavour to increase the vital capacity of the sufferers by teaching them how to breathe properly and efficiently. To do this the demand on the expenditure of energy should at first be reduced to the minimum requisite to fill and empty the chest to its utmost, avoiding any exercise of the muscles which does not bear directly in bringing this about. In this manner as much energy as possible is accumulated at a minimum of cost to the total energy or capacity for work of the individual. To make these children perform systematic exercises for purposes other than increasing the respiratory capacity is a most wasteful procedure and quite beyond that permissible by the amount of their usual income of energy. By increasing their breathing capacity you supply a proportionately larger quantity of oxygen, which enables them as individuals and their several tissues as component parts to perform physiological functions in a more satisfactory manner. The improvement can be gauged by measuring the daily progressive differences between the measurements in extreme inspiration and extreme expiration. Of course, the air breathed should be as good as possible. Secondly, the mouth must be kept shut habitually and certainly during the respiratory exercises air must be driven freely and forcibly in and out through the naso-pharynx alone. If any mucus exists in the nasal passages it must be cleared by blowing the nose vigorously. If this treatment is pursued efficiently and thoroughly the nasal catarrh is removed as well as the irritation and hypertrophy of the lymphatic tissues in the pharynx and there is increase of the lumen of the naso-pharynx with the bony and other structures directly dependent on its development for their complete evolution. The rate at which this result is obtained varies inversely with the chronicity of the condition and with the age of the child. The form of the alveolar arches and of the palate alters, the arch opening out in either case. The change in form which the whole face undergoes in consequence of the increase in size of the naso-pharynx and the cavities communicating with it is in some cases most remarkable, attracting at once the attention of those who have not seen the patient in the interval during which the treatment has been adopted. As to how this is best done must vary largely with the intelligence of parents, their per-everance, and the time and means which they have at their disposal.

In out-patient practice from the circumstances of the parents the treatment can rarely be carried out in the same effectual manner that is possible in private practice, where the patient is under the immediate control of the medical attendant who sees that his instructions are strictly enforced. In hospital work it is well to give the mothers a printed form containing the following or similar instructions: "Put the child on the back three times a day for half an hour at a time, and make it breathe in and out as deeply as

possible through the nose, the mouth being kept shut," and to endeavour to interest them in its application.

In the treatment of this condition, as of many others with which we are constantly confronted, in hospital practice measures have often to be adopted of a more serious nature and at an earlier period of the disease than would be considered advisable for one moment in the case of patients in comfortable circumstances, where the rest, care, and change that they could command would probably produce far better results in the long run. Among the better class of mothers, such as the wives of policemen and mechanics, results will frequently be obtained almost as good as those obtained in private practice; but the poorer portion of the community have neither the time nor the intelligence to follow these instructions, nor will they often devote their energies to the duty. The surgeon can readily determine whether his treatment is carried out efficiently or not by keeping a diary in which the differences between the measurements of the chest in extreme inspiration and extreme expiration must be entered daily. These daily observations will keep him informed of the degree of progress which his patient is making. Should this variation not show a steady increase in amount he can rest assured that his instructions are not being carried out properly.

One of the results of improving the respiratory capacity which is of considerable importance is the steady increase in weight which ensues. The following is a nurse's reports of the progress of a girl under her care for a month and it affords some indication of the results that can be obtained. The measurements are taken at the level of the nipples and represent the inspiratory and expiratory limits. They are certainly better than the average for the reason that every care was taken to make the treatment as effective as possible.

	Inspiration.	Expiration.	Weight.
Feb. 1st	30 inches.	28½ inches.	7 st. 12 lb.
„ 2nd... ..	30½ „	„ „	—
„ 3rd... ..	31 „	„ „	—
„ 4th... ..	31½ „	„ „	—
„ 5th... ..	31½ „	„ „	—
„ 6th... ..	31 „	„ „	—
„ 7th... ..	32 „	„ „	—
„ 8th... ..	32 „	„ „	7 st. 13 lb.
„ 9th... ..	32 „	„ „	—
„ 10th... ..	32½ „	„ „	—
„ 11th... ..	32½ „	„ „	—
„ 12th... ..	32½ „	„ „	—
„ 13th... ..	32½ „	„ „	—
„ 14th... ..	32½ „	„ „	—
„ 15th... ..	32½ „	„ „	8 st. 2½ lb.
„ 16th... ..	32½ „	„ „	—
„ 17th... ..	33 „	„ „	—
„ 18th... ..	33 „	„ „	—
„ 19th... ..	33 „	„ „	—
„ 20th... ..	33 „	„ „	—
„ 21st... ..	33 „	„ „	—
„ 22nd... ..	33½ „	„ „	8 st. 5 lb.
„ 23rd... ..	33½ „	„ „	—
„ 24th... ..	33½ „	„ „	—
„ 25th... ..	33½ „	„ „	—
„ 26th... ..	33½ „	„ „	—
„ 27th... ..	33½ „	„ „	—
„ 28th... ..	34 „	„ „	8 st. 7½ lb.

The treatment was continued uninterruptedly, being superintended by the sister of the patient, and on May 27th of the same year, four months having elapsed since it was started, the following report was sent me: Inspiration, 36 inches; expiration, 29½ inches; and weight, nine stones four pounds. This shows the following increases: Inspiration, six inches; expiration, one inch; and weight, one stone eight pounds.

As the respiratory capacity improves so the child obtains energy to spare, and it becomes more active in the full enjoyment of life. If this treatment is adopted under favourable circumstances one of the links in the sequence—