patients regularly will see serious cases of toxæmia so rarely that the postgraduate obstetric experience necessary to decide when to induce before term, or when to carry out a caesarean section, would rarely be of use to him. When the need arose—say once in two or three years—the help of a specialist could be obtained.

It does not need postgraduate obstetric experience to select for hospital women who have had many previous deliveries and those with a history of an abnormal third stage, or to prevent pregnancy anaemia, or to give an intravenous injection when the head crowns. Students are familiar with intravenous infusion, and any enthusiast who has provided himself with ergometrine, suitable fluid, and a "giving" set, can greatly reduce the incidence and danger of post-partum haemorrhage, and, in the occasional difficult case, keep the patient in good condition until the flying squad arrives.

The possibility of disproportion causes much concern, but, because rickets in childhood has been eliminated almost completely, pelvic contraction is rare and likely to become more so. The only two cases in the personal series were aged 37 and 41, an incidence of 6% in patients over 35 and nil in younger patients. If consultant opinion is available the family doctor should not meet serious trouble with disproportion.

These are some of the more common abnormalities with which the domiciliary obstetrician has to deal. There are many others, but in domiciliary practice most of them are rare. The number of years for which the average family doctor would have to practise to see a case among his domiciliary patients is, for prolapsed cord, 10 years; transverse presentation in labour, 10 years; mento-posterior presentation, 40 years; brow presentation, 50 years; hydatidiform mole, 50 years; ruptured uterus, 300 years; inverted uterus, 600 years. Averages cannot be applied to individuals, but they help to keep a sense of proportion. General practice would be impossible if one of the qualifications for it were postgraduate experience of abnormalities unlikely to be encountered in 10 years of practice.

There are good reasons for making adequate experience in obstetrics an essential qualification for practice in remote country districts, but it appears equally clear that any family doctor who is interested in obstetrics, and who, as a student, has had adequate instruction in the aspects of midwifery likely to be met in general practice, can be allowed to supervise maternity cases in any area where consultant support is available, without the risk of serious consequences for his patients. The role of practitioners with postgraduate obstetrical experience should be to practise either in country areas where consultant help is not readily available or as members of a group, where, by helping their colleagues with difficult cases and by providing a liaison between them and recent advances in obstetrics, they can help to maintain a high standard throughout the group, without taking the day-to-day care of maternity cases out of the hands of the family doctor.

Summary and Conclusions

An inquiry has been made into the practice of obstetrics (1) in a general practice over a period of six years; (2) in a community of 67,000 inhabitants over a period of three years; and (3) in a further 1,000 domiciliary deliveries.

In group 1 the case records were those of a medical practitioner, and in groups 2 and 3 those of midwives. The following suggestions are offered.

Premature delivery, breech delivery, and multiple birth carry a stillbirth or neonatal death rate too high to be acceptable for domiciliary delivery. The rates for first births do not suggest that normal primiparae should be delivered in hospital.

Domiciliary forceps delivery is inevitable in a small proportion of cases, but the risks are not great. The proportion can be reduced considerably if hospital

delivery is arranged for primiparae who are over 30 years of age or who are not fully dilated after 24 hours in labour.

More frequent use of episiotomy in domiciliary work would reduce the forceps rate and the incidence of severe tears, and would avoid many long second stages of labour.

Toxaemia can be controlled to a very great extent if blood pressures are observed frequently and if adequate attention is paid to slight rises.

Intravenous ergometrine at the end of the second stage can be used with advantage in domiciliary practice, particularly in forceps deliveries.

Interest in obstetrics and adequate instruction as a student are the only essential qualifications for the family doctor who wishes to practise obstetrics in an area where consultant support is available.

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CONDITIONS ASSOCIATED WITH THE GROWTH OF BOYS, 1950-1

BY

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The changes which have taken place over the years in the growth of children are generally, and we think rightly, attributed to improvements in their food. Whereas during the slump years dietary surveys showed a grossly deficient diet, a study made in 1949 by Beltram and Bransby (1950) of children from the lowest income group (parent earning £4 10s. or less a week) showed average intakes which compared "satisfactorily" with the recommendations of the B.M.A. Committee on Nutrition (1950) in respect of all nutrients with the exception of vitamin D, the requirement of which at school age is still a matter of complete uncertainty. If this was the case for the lowest income group, then it could be argued that an actual margin of safety existed in higher income groups. It is, of course, obvious that about half of the group surveyed by Beltram and Bransby must have had intakes below the B.M.A. recommendations, but nutritional "standards" are set, deliberately, on the safe side of the optimum, and it is at least questionable whether many boys, even in this group, consumed too little of any nutrient.

There is, too, evidence from the past to suggest that schoolboys' diets may now be adequate. The last large milk-feeding experiment, carried out for a year on 2,800 children in 1934-6, showed gains in height and weight

in all groups; but they were small and none was statistically significant; the opinion that they were, in fact, real was formed on the grounds that they were consistently found in all of the groups. Since then, not only has milk been added to the diet of school-children, but their diet has been enormously improved in other respects. Again, a feeding experiment carried out during the war (Bransby, Burn, Magee, and MacKecknie, 1946) tested the effect of a supplement of vitamins A and B₁, riboflavin, nicotinamide, ascorbic acid, and vitamin D on 800 children for a year. No effect was observed on growth, strength, endurance, or absenteeism.

It is of interest, then, to note that well-marked differences in stature still exist in children, not only between the lowest income group and the one above it, but fairly evenly throughout most of the social scale.

Cause of Differences in Stature

In view of the evidence cited above, it is worth while to consider the other possible causes for these differences in stature. The first is that these differences are hereditary. But the considerable changes in stature that have occurred as a result of environmental change should make us very wary of accepting this. The finding of Weir (1952) that "secular changes in growth are similar to the differences in growth associated with differences in social condition" adds point to this.

Another possibility is that the rate of growth is inexorably set as a result of conditions in the early years of life, and if these are adverse no subsequent improvement can lift the child out of his "growth channel." This has been shown to be the case in underfed pigs by McMeekan (1940), and in his study certain changes in skeletal proportion occurred, which, as Leitch (1951) has pointed out, are similar to skeletal differences to be found between children of different social classes. But application of the findings of animal experiment to man needs always to be made with caution. Moreover, Bransby (1953), studying the diets of 461 children over 6 months and under 5 years in 1951, found that in high income groups the nutrient intake was just as often below the optimum in some respect as it was in the low income groups; yet, at any rate by the age of 6, differences in stature can be demonstrated in association with social class. Nevertheless, the work of Yudkin (1952b), in which a liver supplement fed to small children on an otherwise excellent diet enhanced growth, reminds us that all may not yet be known concerning the essentials for growth.

A further possibility is that some factor other than diet may operate to an important degree to-day. This has never been adequately explored because, as Cruickshank (1951) has put it, "heredity and environmental factors—nutrition, poor housing, lack of sleep, infectious disease—are inextricably interrelated in determining the growth and development of children." The only instance, so far as we know, in which a non-dietary factor has been demonstrated to affect the growth of children in the mass was reported by Widdowson (1951). German orphans, she found, grew better when the matron in charge of them was motherly and kind than when she was severe, though their diet remained the same. Other non-dietary factors have never been studied in isolation. For example, no one can be confident that the environment of our great industrial cities is favourable to the growth of children, and it is in these, typically, that growth rates are least.

We may presume that the answers to all these problems will ultimately be writ clear in the stature of future generations. There are, too, long-term research studies afoot which may somewhat anticipate the event. But in the meantime we do not even know whether there may not be conditions affecting the stature of large numbers of children and thus preventing them from benefiting fully from im-

provements in their diet. The public health aspects of this question appeared to us of sufficient importance to warrant a reconnaissance.

The Investigation

The plan of investigation was as follows. In Beltram and Bransby's survey the intakes of Salford schoolboys were analysed separately and found on the whole to be slightly higher in most nutrients than the rest. Salford is an industrial city, with mean crowded houses, and much smoke and rain. Here, therefore, non-dietary conditions might be expected to operate at a maximum, and dietary ones at a minimum. The stature and physique of Salford boys, at three age levels, were therefore compared with those of boys at Kingston-on-Thames, a sunny pleasant town. At each place, each age group was examined at one season and in the same year. At Bristol a study was carried out on a larger group of 14-year-old boys, and the findings were analysed in terms of social class and similar factors. Our aim was to test whether the differences between stature and physique in industrial and other areas were similar to the differences that occur between different social groups—in effect, an extension of Weir's dictum quoted above.

In addition, we obtained at Bristol as much information as we could about dietary and non-dietary factors. Before the war Bristol built a large housing estate for families who had previously lived under slum conditions in the city. Data on these boys were compared with those on boys still living in the heart of the city. Thus the environmental differences between these groups reflected *in parvo* those seen *in magno* in Salford as compared with Kingston. Since we interpreted Widdowson's study as showing the effects of mental stress, we analysed separately the weights, in Bristol, of boys from "broken homes," in which category we include parental death and divorce and illegitimacy. We also compared boys whose mothers went out to work with those whose mothers did not, for it had been retailed to us elsewhere that children often came home to an empty house, or even had to wait outside a locked door, and that they were on occasion sent to school when they should really have been in bed, because the mother could not afford to lose her day's work; we therefore felt that in this group some form of mental stress might operate. One further point was tested: in our surveys in previous years it had been the practice to record the number of boys who had a "tired expression." Inquiry had shown that a high proportion of them shared beds, and, to judge by their looks, did not get enough sleep. We therefore analysed our findings in terms of those who did and those who did not share beds.

Physical Findings

Stature and Physique.—Table I gives the mean heights and weights of boys in the different groups, and the numbers involved. The children at all ages are lighter and

TABLE I.—*Weight and Heights of Boys in Different Parts of Britain*

	Age	No.	Weight in kg.	Height in cm.
Salford ..	6 years	149	20.83 ± 2.45	114.38 ± 5.08
Kingston ..	6 "	197	22.63 ± 2.72	118.00 ± 5.69
Salford ..	10 "	197	28.78 ± 4.24	133.76 ± 5.40
Kingston ..	10 "	135	32.70 ± 4.79	139.61 ± 6.10
Salford ..	14 "	206	44.39 ± 9.14	154.10 ± 9.09
Kingston ..	14 "	190	48.61 ± 8.3	160.50 ± 8.57
Bristol:				
Modern ..	14 "	210	46.78 ± 7.62	158.39 ± 8.99
Grammar ..	14 "	167	50.52 ± 8.02	164.82 ± 8.71
A public school	14 "	76	51.63 ± 6.71	166.50 ± 7.82

shorter at Salford than at Kingston, and at Bristol the modern-school boys are lighter than the grammar-school boys, who are in turn lighter than public-school boys. We compared the height/weight ratio in the different groups to test whether they showed the tendency, reported by Weir,

towards a slimmer build where mean growth was greater. No consistent or statistically significant differences were found. As a further test, we expressed the biacromial and bitrochanteric diameters, and the chest girth, as percentages of height (Table II). It will be seen that in every set of comparisons the group shown in Table I to be taller and heavier is also slimmer.

TABLE II.—*Biacromial, Bitrochanteric, and Chest Measurements Expressed as a Percentage of Height*

	Age	Bitrochanteric	Biacromial	Chest Circumference
Salford ..	6 years	18.8	22.7	49.7
Kingston ..	6 "	18.2	22.3	48.2
Salford ..	10 "	18.6	22.0	—
Kingston ..	10 "	18.1	21.3	—
Salford ..	14 "	18.9	21.8	47.0
Kingston ..	14 "	18.6	21.5	45.3
Bristol:				
Modern ..	14 "	18.6	21.0	46.2
Grammar ..	14 "	18.3	21.0	46.1
A public school	14 "	18.0	20.8	45.6

Development.—Following on Greulich's work in America, Ellis (1947) showed that Barnardo boys who became pubertal early grew more rapidly than their fellows. The differences here were presumably genetic in origin, but data collated by Stuart (1946) show that improved socioeconomic circumstances accelerated the onset of puberty. We therefore studied the stage of puberty in our 14-year-old boys. We held that because we knew the plan of our study, and the place of our different groups in it, unconscious bias could creep in, and we therefore concentrated on the physical index of puberty which we considered the least subjective—namely, the condition of the pubic hair. We felt our groups were large enough to offset the errors due to the use of a single criterion. We recorded four degrees; complete absence of hair (PH-), a few downy hairs (PH±) an intermediate stage (PH), and a well-developed escutcheon (PH+). At Bristol we were fortunate in having as a check the findings of Drs. Irving-Bell and Fraser, of the Bristol school medical service, on the same boys. They used a system of classification to which they were accustomed, with three grades only, but the trend of their findings clearly confirms our own (Table III). There is a lag in puberty in Salford compared with Kingston, and in Bristol modern compared with grammar schools.

TABLE III.—*Percentage in Each Group at Different Stages of Puberty From Pre-pubescence (PH-) to Adolescence (PH+)*

	PH-	PH±	PH	PH+
Our findings (P.J.C.):				
Salford schools ..	33.8	11.7	40.0	14.5
Kingston ..	13.4	22.6	22.6	41.4
Bristol modern schools ..	10.8	18.5	40.0	30.7
Bristol grammar ..	7.8	15.0	26.1	51.1
Public school ..	7.9	19.7	32.9	39.5
Dr. Frazer:				
Bristol modern (71 boys)	25.4	60.5	14.1	
" grammar (55 ")	2.9	45.4	52.7	
Dr. Bell:				
Bristol modern (138 boys)	13.0	44.9	42.0	
" grammar (106 ")	8.5	28.3	63.2	

Pallor.—Yudkin (1952a) reported that pallor was associated with underdevelopment. Differences in lighting, etc., made it impossible to compare our groups with one another, but a comparison could be made within each group. Only about 20 boys in each group were recorded as pallid, but in each case they were on average lighter than their fellows. The difference was on average about 4%. On the other hand, no consistent difference whatever was recorded in height.

Fat Covering.—Because pallor is an early sign of under-nutrition, data on the skinfold thickness of our groups are of interest. There were no statistical differences between the mean readings of comparable groups, but when

we separated in each group the "thin" boys (with readings below the norm for all boys of their age group) and others, the former showed consistently lower mean weights, and, with the exception of one group, the Kingston 6-year-olds, in which there were only 28 "thin" boys, consistently lower mean heights. It is to be expected that the "thin" boys would be slighter, but it is surprising that they should also be shorter. Details both of these findings and of those relating to pallor are omitted for reasons of space.

Environmental Conditions Associated with Difference in Stature

In relating environment to stature, weight only was taken into account. Height varied similarly, but in less degree, and there was therefore no point in including it. The data given below are from Bristol only. In a few cases in which the information provided was inadequate the boy was excluded from that part of the analysis.

Diet.

It was not practicable to carry out detailed dietary surveys of such large numbers of boys. Instead, each boy was questioned about the frequency with which meat or fish was provided for him, upon the number of times a week that he ate fresh fruit, and on the amount of milk he consumed, which was checked by determining the amount delivered daily for the family, and making allowances for the other members (their ages were known); the amount drunk at school was known. The whole of this work was done by Miss C. M. Wood, nutritionist on the staff of the M.O.H., Bristol. The diets have been classified as "poor," "average," and "good," in the case of each of the three indices, on the following basis: "Poor" = Meat or fish once or less a day; milk less than half-pint daily; fruit less than every other day. "Average" = Meat or fish for more than two meals daily; milk one pint daily or more; fruit daily. The average diet was intermediate between these. Obviously the biochemical content of the diet cannot be assessed by this means. But an indication is provided of the extent to which variety enters into the diet, and it is axiomatic that the greater the variety the greater the likelihood that the diet is balanced.

As the graph shows, whatever criterion is used the mean weight increases progressively from "poor" to "good." The differences between the extremes are statistically significant in the case of meat and fish, and of milk.

Non-dietary Conditions

Parental Care.—Each boy's home was visited by a health visitor and an assessment made of the standard of parental care. The mean weight of 122 boys with "very good" parental care was 51.63 kg.; of 220 with "normal" parental care it was 47.16; of 17 with "bad" parental care it was 46.26. The first of these differences is statistically significant, and the second is in keeping with the trend of the data.

Parent's Occupation: Type of School.—The Registrar-General's classification was used (here written R.G. I to V in

Graph showing association between dietary pattern as indicated by number of servings of various foodstuffs, and weight. —, Meat and fish. ---, Milk., Fruit.

descending social order). There was a relation between R.G. category and weight, in grammar schools the means (in kg.) being R.G. I and II, 52.95; III, 49.86; IV, 48.87; V, 47.38; and in modern schools 47.64, 46.89, 46.85, and 46.37 respectively. It may be noted that in every case grammar-school boys are heavier than modern-school boys of the corresponding R.G. group. In general, grammar-school boys have passed, and modern boys have failed, an examination at the age of 10-11 years, and the implied difference in "intelligence" is presumably also to be found in their parents. We feel that the R.G. classification, the type of school, and the assessed parental care should be regarded merely as different indices of the care given to the welfare of the child.

Bed-sharing.—A relationship, if any, with bed-sharing needed to be separated from the factors shown above to be associated with stature. Therefore (1) the mean was found for all boys who shared beds, and (2) this was "matched" by a mean made up of boys who did not, but were otherwise identically placed as regards the environmental factors noted above. The mean of 100 boys who shared beds was 45.6 kg.; the figure for the matched mean was 47.8. Formal tests of significance could not be applied to this difference because of the complexity of factors concerned, but the difference is large and showed up with great consistency throughout the process of analysis. We therefore think that it is real.

Open Surroundings.—Sixty-three boys who lived in the heart of Bristol were compared with a "matched sample" who had lived almost all their lives in the open surroundings of a modern housing estate. The difference, 1.41 kg. in favour of the latter group, is too small in view of the size of the sample to enable an inference to be drawn.

"Broken Homes."—Twenty-eight boys from broken homes had a mean weight of 48.7 kg. as compared with a mean of 48.5 kg. for a matched sample from unbroken homes. This sample is small, but we may add that we were also unable to demonstrate any difference in this respect in either Kingston or Salford.

"Mother Goes Out to Work."—The mean weight of 105 children whose mothers went out to work was 49.8 kg. That of a matched sample was 47.0 kg., a difference so great as unlikely to be a "chance" occurrence. In the case of boys from modern schools it was permissible to make a direct comparison without resorting to matching, because there was little difference between the mean weights of R.G. groups in modern schools. In the modern schools, 65 boys whose mothers went out to work had a mean weight of 48.9 ± 9.33 kg., compared with 145 boys with mean weight 45.8 ± 8.13 . These differences are statistically significant.

Independence of Dietary and Other Factors

The mean weight (kg.) of grammar-school boys on "poor," "average," and "good" diets was 47.6, 50.3, and 52.0 respectively. For modern schools it was 46.1, 46.4, and 48.1. The corresponding figures for good parental care were 48.5, 51.6, and 52.1, compared with 46.6, 46.4, and 48.4 for average parental care. For R.G. I and II they were 49.0, 52.7, and 54.0, compared with 46.9, 47.0, and 50.0 for R.G. III, IV, and V combined. Whatever the social criterion used, those assessed as "good" stand well above their fellows of the corresponding dietary pattern. The data above are for consumption of meat and fish. The other dietary indices gave a similar picture.

Discussion

Physical Findings

This work confirms the report of Weir that where the stature of children has increased the physique is slimmer. The findings on puberty are in harmony with those cited by Stuart upon the effect of good social conditions in accelerating the onset of puberty.

The differences between Salford and Kingston are similar in character to those between the different social groups in Bristol. This, we hold, extends the implication of Weir's work comparing secular change and social differences.

Environmental Factors

Certain negative points are best cleared up first. We adduce no evidence that mental stress affected the stature of our groups; in fact, one of our "stresses" was associated with exactly the opposite result. We cannot say whether residence in open surroundings confers any advantage over residence in the heart of a city, for the fact that the difference found was small does not mean that it may not have been real. Whether the association between weight and bed-sharing was in fact causal could only have been proved by the provision of beds.

The inquiry was not designed to throw light on the effect, in after years, of environmental conditions affecting the growth in early childhood, and some of the contrasts in weight that we have recognized may simply be the result of factors which operated then. For example, there was little difference in the dietary pattern of boys whose mothers worked and of those whose mothers did not work, but it does not follow that differences did not exist in early years, particularly if those having working mothers were left for any part of their pre-school life in the nutritionally excellent environment of a day nursery.

The association between dietary pattern and weight shown in this study does not support the hypothesis put forward at the outset concerning the adequacy of schoolboys' diets. There are, of course, possibilities other than the obvious one. (1) The "poorer" diets may be adequate for growth at 14, but boys on them may also have lived on poorer diets earlier when their rate of growth was relatively greater. (2) Since the provision of a varied diet is a function of a good parent, it may be that we are merely recording degrees of parental care which were not shown up by the social criteria which we used in this study.

The relation, at all dietary levels, between weight and "very good" and "normal" parental care is reminiscent of Widdowson's demonstration of the influence of the motherly matron on the orphans in her care. Here too, however, other possibilities exist, because our dietary criteria are not exact, nor do they provide information about the diet at other seasons or earlier in life.

The problems raised in this study would not have been resolved had the same approach been used but with greater detail and exactitude. For example, even using the conventional (and costly) method of dietary survey, doubt would have arisen whether any association found between growth and diet was in fact causative. This study suggests that non-dietary factors cannot be ignored as a potential cause of checks to growth, and further progress in this direction would seem to depend upon the development and testing of working hypotheses on how such factors may operate. Presumably they either act "centrally"—for example, through the endocrine system (in which case, for lack of knowledge, no guess can be hazarded regarding the way in which they work)—or there is some disturbance in the equilibrium between intake and the needs of energy and of growth. From clinical studies in time of hunger, and from animal experiments, notably by Young (1945) and by Greenbaum and Maclean (1953) it may be concluded that under certain conditions competition between growth and energy requirements does occur. There is, too, some evidence that this may occur in everyday life. For example, Macy and Hunscher (1951) have reported that for some children the voluntary intake level is not sufficient for "satisfactory" weight gain or nitrogen retention, and that these may be secured by increases of total intake of 10 calories per kg. body weight. Similarly, Hubbell and Koehne (1934) report improved nitrogen, calcium, and phosphorus retention in children whose calorie intake was increased 16-18% by the addition of sugar.

The finding of Yudkin (1952a) that pallor was related to poor development (but not to haemoglobin level), which we confirm in respect of weight, is of interest in this connexion, for pallor is an early sign of undernutrition. A possible explanation is that over long periods of life the

equilibrium between growth, activity, and appetite is set at a low level, owing to some factor affecting the last of these. Whether "undernutrition" of this nature could affect growth without effect on the surface fat, or with such small changes only as we have reported, is unknown; it is not the sole, and may not even be the prime, function of the surface fat exactly to make good deficits of intake.

There are, as already noted, long-term growth studies in progress, some of them on the general public. The practical value of these will depend in part upon the success with which the factors affecting growth are recognized at the time and their intensity is gauged. This is impossible in the case of non-dietary factors without working hypotheses regarding their *modus operandi*. Hence these considerable speculations. We would suggest, among such hypotheses, that such things as a varied and tempting diet, adequate sleep, and regular bowel habits, and similar attention to the fitness of the child, may affect appetite and therefore growth rate.

Summary

Recent published evidence on schoolboys' diets and stature has been reviewed. Possible reasons for the differences in stature which still persist are discussed, and a field study of a reconnaissance character is described.

The findings confirm the report by Weir (1952) that increase in growth rate is associated with slimmer physique.

Differences in physique between boys in an industrial area and others elsewhere are similar to the differences in boys of different socio-economic environment.

Boys with pallor were found on average to be lighter, confirming a part of Yudkin's (1952a) findings on the significance of pallor. Thin boys were found to be lighter and also shorter than others. The possibility that these findings mean that in some individuals growth is checked because appetite is inadequate is discussed in the light of American work.

Varied diets, as indicated by frequency of consumption of meat and fish, milk, and fruit, were found to be associated with higher weights.

There was a relationship, independent of the association between weight and diet, between weight and the standard of parental care, social class, and type of school.

We wish to express our gratitude to the Medical Officers of Health of Salford, Kingston, and Bristol for their help. We are much indebted to Miss C. M. Wood, Dr. R. J. Irving-Bell, and Dr. A. M. Fraser, of the Bristol Public Health Services, and to many health visitors, school nurses, and others in the three areas for their kind collaboration.

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ENTERIC PNEUMATOSIS

BY

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Enteric pneumatosis is characterized by the occurrence of gas-containing cysts, either sessile or pedunculated, arising in the submucous and subserous layers of the small intestine. They attain the size of a grape and tend to appear in local masses, which in turn may be multiple. They are classically more common on the mesenteric aspect of the bowel and are confined to the small intestine and proximal half of the large intestine.

These cysts are similar in appearance to lymphangiomas, having a thin translucent wall, and are composed of delicate connective tissue lined, at least partially, by endothelium and with evidence of giant-cell formation. The entire microscopical appearance supports the view that the longevity of these cysts is not so much the result of their own perpetuity as of continual replacement due to some influence not understood. The contents are gaseous, being composed mostly of nitrogen with smaller proportions of oxygen and occasionally carbon dioxide, hydrogen, and methane.

Theories on the Cause

Various theories of the evolution of this condition have been expounded, and Masson (1925) has examined these in some detail. It has been thought that these collections of gas are caused by gas-producing organisms, but experiments have failed to produce a similar condition. Further work has been done to investigate possible penetration of intestinal mucosa, associated with increase in intestinal pressure such as may occur in vomiting, coughing, or constipation, but this theory in turn has been disproved, as the cystic gas has not shown the same constituents as intestinal gas.

It is now accepted that this condition is in fact one of gaseous dilatation of lymphatic channels. Masson has investigated the causation of this phenomenon, and concludes that the fundamental pathology lies in lymph stagnation in tortuous or obstructed lymph vessels. He further states that absorption of carbon dioxide and lactic acid from the intestinal mucosa occurs into blocked lymphatics, and that this is followed by liberation of the carbon dioxide, and by diffusion of nitrogen, oxygen, and occasionally methane from capillaries; the resultant ratios of the gases being adjusted by the laws of diffusion governing the partial pressures of gases.

Masson and others have suggested that enteric pneumatosis occurs in association with digestive disturbances, and especially those due either to gastric or to duodenal ulceration, although the cause for this is not clear. Various other authors assert that it is associated with such conditions as intestinal tuberculosis, acute and chronic appendicitis, colitis, and many others, but these seem to be purely coincidental.

Koss (1952), in a review of the literature, has noted the clinical course of this disease. He asserts that the disease may develop within a relatively short time, as confirmed by operative findings. There is also considerable evidence to show that these cysts may disappear spontaneously, but certain complications have been noted. Pneumoperitoneum may occur owing to spontaneous rupture of the cysts, but intestinal obstruction seems to be the most likely complication. The obstruction may be precipitated by blockage of the bowel lumen by submucous cysts, by volvulus induced by a cyst mass, or by extrinsic obstruction due to pressure by cysts or adhesions arising as a result of the condition. Koss reported one case of intussusception due to gas cysts.

This disease has been described as occurring in the vagina during pregnancy, and the first, albeit inadequate, descrip-