bag of membranes of which the amnion forms an integral part so thin that the first uterine contractions produce escape of the waters, while in other cases the membranes are so tough as to impede the progress of labour and require puncture for its acceleration. Dubois⁵¹ says the feeble resistance of membranes may be due to natural structure, I suppose as some women may have thinner skins than others, or it may be due to alterations consequent on inflammation. However produced, it may, by facilitating rupture and escape of the liquor amnii in early pregnancy and before the child is viable, lead to intra-uterine death, for it is well known that pregnancy cannot continue long after the entire evacuation of the amniotic fluid.

The question as to whether there is true inflammation of the amnion has been discussed, and various supposed pathological results have been pointed out. Jacquemier details three cases which he regards as clearly indicating the occurrence of inflammation on its free surface. One of the patients had peritonitis, and aborted five days later; another had been kicked in the abdomen at the third month, and although she went to the full time, there was a rapid development in size of the abdomen as the result of the injury, and a large quantity of liquor amnii was formed in the uterus. In all the cases the membranes were thickened and traversed by abundant vessels, and in one the containing fluid was cloudy and whitish in colour, with flakes like curd of milk floating in it, which were portions of false membrane detached from the free surface of the amnion.

The adhesions sometimes noticed between the amnion and the umbilical cord, between the amnion and the fetus, are almost invariably associated with some malformation or monstrosity of the child, and have been attributed to inflammatory action. The difficulty in accepting this theory is the general absence of other inflammatory signs in such cases, besides the mere adhesion and its associated monstrosity.⁵² The natural history of such malformations further points to some entanglements of embryonic structures in the process of development, these resulting in distortion and displacement of normal parts.

The condition which has received most attention in connection with the pathology of the amnion is what has been termed "Hydramnios," or superabundance of liquor amnii. The presence of a certain amount of fluid in the cavity of the amnion is necessary to the development of the fetus, but in some cases it is so abnormally large as to endanger the life of the child, and if it does not necessarily bring peril to the mother, it at any rate places her in very grave discomfort. Dr. Kidd, who wrote on the subject in the *Proceedings of the Dublin Obstetrical Society* for 1878, limits the term "hydramnios" to those cases in which more than two quarts of amniotic fluid are present. The quantity of fluid is sometimes very large. Baudelocque gives one case where thirty pints escaped from the uterus; other authors give thirty or forty pints. Coming on suddenly in some instances, more slowly in others, the fluid so distends the uterus that it acquires a volume entirely disproportioned to the stage of pregnancy. The result to the mother is that she may suffer greatly from the distension. Respiration is impeded, and the patient may not be able to lie down night or day. The digestion is deranged from physical pressure, and the heart's action is disordered, while other secondary symptoms, such as oedema of the lower limbs and blueness of the countenance, may be superadded.

The effect on the child is to impede its development, and, if born alive, it is commonly too feeble to survive its birth. Frequently the child is affected with dropsy, hydrocephalus, or other complication. Of thirty-three cases mentioned by McClintock, nineteen children only were born alive; ten of these died a few hours after birth, and nine survived. Often the fetus dies *in utero*, and may then be retained a considerable time after its death, thus prolonging the discomfort of the mother. The condition has a tendency to repeat itself in the same woman. I saw a patient some years ago in her tenth pregnancy, who was sent to me by Dr. Matthews Duncan, and who had suffered from hydramnios in nine out of the ten gestations, losing most of her children, the first pregnancy being the only healthy one.

There is an extensive literature on the subject, but little is known as to the cause or causes. Mercier noted traces of inflammation in the amnion, but Dubois and Desormeaux cite cases where there was no appreciable lesion of the membranes, and there are no constant appearances in the placenta associated with the condition. Churchill attributed it to excessive secretory activity in the amnion, and

various other explanations have been given, but they do not add much to the precision of our knowledge of its causation.

In the case I have alluded to as occurring in my own experience, there was nothing to account for the phenomena beyond a short residence in India, which had impaired the general health, and I found no albumen in the urine.

It has been said to be rare before the fifth month, but in going through the museums, I find many examples of it in the earlier periods of pregnancy; and both from this and my own experience, I infer that it is far from infrequent in the first half of gestation. In St. Mary's Hospital there is a specimen in which the amniotic cavity is from three to four inches long, and the embryo is not larger than a horse-bean. In St. Bartholomew's, again, there is a large amniotic cavity with no embryo at all.

Merriman,⁵³ Robert Lee,⁵⁴ and others attribute hydramnios to a morbid state of the mother, and particularly to the effects of syphilis. That the liquor amnii may be affected by the state of the mother is evident from many facts. Dr. Duncan,⁵⁵ in a paper on Puerperal Diabetes, states that hydramnios is frequent in association with this condition, and sugar has been found in the liquor amnii. Two or three facts have been distinctly made out in relation to its pathology.

1. Scarpa⁵⁶ noticed a coincidence between this form of dropsy and the presence of twins. This has been fully confirmed by the observations of Winckel,⁵⁷ McClintock,⁵⁸ and others.

2. In pregnancies complicated with hydramnios, the child often presents some vice of conformation. Monsters are, in fact, common with this affection.

3. The children born with a superabundance of liquor amnii often present evidences of syphilis, and this whether they are born dead or alive.

4. Hydramnios is comparatively rare in first pregnancies as compared with others.

5. It is more frequent with female children than males. Of thirty-three cases collected by McClintock, only eight were males.

The impression derived from a careful study of all the circumstances is, that hydramnios is not a product of inflammation of the amnion, as some have supposed, but that it arises sometimes from constitutional conditions affecting the mother, sometimes from local causes. The idea of local origin, in some cases at least, is strengthened by the fact that it may occur with twins, one only being affected; and Charpentier mentions a case where the abdomen increased rapidly after local injury from a fall at the fifth month, and the woman was delivered of a dead child at seven months with seven to eight litres of liquor amnii. In this instance, the placenta was found to be diseased to a third of its extent. It would thus seem to be due to some fault in development, as cystic chorion is a fault of this kind.

ON THE ALLEGED DANGERS OF STARCH-CONTAINING FOODS DURING THE PERIOD OF INFANCY.¹

By ROBERT WILLIAM PARKER, M.R.C.S.ENG.,
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SIR GEORGE CORNEWALL LEWIS, in his admirable essay on the Influence of Authority in Matters of Opinion, defines the "principle of authority" as the principle of adopting the belief of others, on a matter of opinion, without reference to the particular grounds on which that belief may rest. I do not think I am wrong in asserting that the belief in the dangers of starch-food during infancy is widespread, and generally accepted in our profession.

It appears to me that it may be advantageous to inquire into the grounds on which this belief rests; whether, in fact, it exists as an abuse of this principle of authority, and whether the grounds on which it rests are sufficient and trustworthy. In order to get a decided expression of opinion on this point from the Fellows present, I will somewhat dogmatically state the opinion I have come to adopt after many years' work in a children's hospital, namely, that the dangers of starch-foods are very greatly exaggerated. I may even go further, and say that I have never myself met with cases in which I could distinctly and directly trace disorder to starch-foods.

⁵³ *Synopsis*, etc., 1838.

⁵⁴ *Theory and Practice of Midwifery*.

⁵⁵ *Obstet. Trans.*, 1882.

⁵⁶ *Opuscoli di Chir.*, 1825-32.

⁵⁷ *Path. der Geburt*.

⁵⁸ *Diseases of Women*.

¹ A paper read before the Medical Society of London on April 4th, 1887.

⁵¹ *Diet. en 30 volumes*, Art. Hydrométrie.

⁵² Courty says when the phenomena are produced early, it is by the liquor amnii being absorbed, and the membranes then acquire adhesions to the integument of the fetus. In others, inflammation is the cause, and there are false membranes formed from the amnion.

Let me, however, lead up to the position I now hold. For my object in saying that starch-food is not so injurious *per se* as is usually represented is not to advocate artificial feeding in preference to nursing, but to draw attention to what I believe are the real and proximate causes of the immense mortality which obtains among young children, especially among the children of the poorer classes—namely, congenital debility.

The artificial feeding of infants is at present going on to an enormous extent, as may be judged by the great variety of artificial foods now in vogue, and the large way in which they are advertised. If, as a commercial maxim says, the supply is regulated by the demand, the demand must be large indeed.

It cannot be gainsaid that very many artificially-fed children are puny and weakly, and it has come to be generally accepted that the children are puny and weakly because they are so fed. On the other hand, an analysis of any 100 wasted and weakly children will show that a considerable number of them are breast-fed; and further, that of those which are being artificially fed, many were puny and weakly when artificial food was commenced, and that artificial food was either added to the nursing, or substituted for it, because the children were not thriving.

What inferences, then, are to be drawn from these facts? First and chiefly, that many children are congenitally deficient in the vitality and digestive power which are absolutely essential to their healthy development. Such children will be weak and puny on any diet. Such children as these, moreover, are just the kind of children we should expect to be born of women (of parents) themselves weakly, either congenitally or from acquired causes, such as irregular modes of living, drink, poverty—leading as it does to privation of every kind: food, fresh air, light, rest, etc. Can women exposed to such conditions as these be expected to give birth to strong, healthy children, or even to produce good milk in sufficient quantity to nourish their children properly?

Towards deciding the issue raised, I will give an analysis of 100 histories of artificially-fed children, under twelve months of age, taken from among my patients attending the East London Hospital for Children. I have not selected these cases, but have taken them just as they came to hand. I believe the results would not differ much if I had analysed 1,000 instead of 100, nor do I think that any very important divergence would have been found if the cases had been taken from private instead of from hospital practice.

An Analysis of 100 Cases of Artificially-fed Children.

- In 3 cases the mother had died, and the child was being brought up by strangers.
- In 2 cases (illegitimate) the mother had deserted the child, and it was being brought up by strangers.
- In 1 case the child was separated from its mother because she got puerperal mania.
- In 2 cases the mother had been sent to prison.
- In 17 cases the mother was too weakly to suckle her child entirely.
- In 30 cases the milk of the mother was "hungry milk," by which is meant milk "which does not seem to satisfy the child."
- In 20 cases the milk-supply was deficient.
- In 25 cases the mother was obliged to go out working during the day, leaving the child to be looked after in one way or another.

= 100 cases.

Otherwise stated, in 8 cases the mother was not available for nursing purposes. In 17 cases she was said to be too weak to nurse. In 20 cases the milk supply was deficient in quantity. In 30 cases the milk was deficient in quality; there was a plentiful supply, but it did not satisfy the child. In 25 cases the mother was poor, and had to earn a living for her family.

A third analysis of these cases shows that in 75 per cent. the milk was deficient in quality or quantity from one cause or another. This is another way of saying that the mother herself was deficient in power or overtaxed in strength, obliged, in fact, to be doing heavy manual work during her pregnancy, and up till within a few days or hours even of her confinement. One of the women had had thirteen children in ten years. Several of them had had three, four, or five children in three, four, or five years—that is to say, a child every year. In a few cases there had been a fair supply of milk, but the mother had been advised to feed the child, and not to suckle, because she was of a tubercular habit. One or two of the women were syphilitic, and had not suckled on this account. In 35 per cent. of the cases the mothers were acting under medical advice

in not suckling their children. In 92 per cent. of the cases the children had been suckled for varying periods (from a few days only up to weeks or months); in only 8 per cent. of the cases the children had never had the breast at all.

The foregoing details may be finally summarised; they show that in a very large percentage of cases the lowered health-status of the mother is obviously the reason why artificial feeding of their children has to be adopted. It does not need any long experience to enable one to predicate that if the mothers are weakly their offspring likewise will be weakly. It follows, therefore, that the reason why so many children are fed on artificial food is that they do not thrive on the breast-milk of their mothers, or that they do not thrive on that alone.

Thus, in estimating the causes and treatment of marasmus and other kindred diseases in infancy, it seems to me that too little stress is laid on the congenital debilities under which vast numbers of children labour, and too much stress is laid on artificial feeding, especially on the injurious effects of starch-containing food. It is, as I have said, on this point that I particularly desire to learn the experience and the opinions of the Fellows of this Society. The extent to which this starch-food theory is carried and emphasised by the leading authorities in children's diseases may be gauged, in some measure, apart from their writings, by the efforts now being made by the purveyors of infants' food to outdo each other in the completeness with which all starchy particles are broken up into less dangerous and more digestible compounds.

By none, more dogmatically than by me has this doctrine been promulgated in years past. But latterly a more independent and wider view of the subject, its proximate as well as its predisposing causes, have induced me first to question the truth of this starch dogma, and now to doubt it altogether. I stand forward to-night an avowed sceptic of the doctrine that starch-food *per se* is injurious to the infant organism. Let me be quite clear. I do not question the immense value of good maternal nursing, nor underrate the dangers and disadvantages of artificial feeding, nor that infants are unable to digest starch. I simply question the truth of the belief that starch foods are actively injurious, and for the following among other reasons: That many and many a child is now alive and well to testify against such a doctrine; that in years gone by, before malted foods came into vogue, hundreds of children thrived upon milk thickened with a little of one or other of the common starch-containing cereals; that there are no experimental investigations to warrant such an assertion; that, as is well known, animals, when fed on starch, do not get rickets and the diseases usually attributed to starch-feeding—they die of inanition; that the starch taken in with the food passes out with the *fecæ*s unaltered. If it could be shown that the starch was broken up into other and deleterious compounds, there would be something to go upon, but, as a matter of fact, the starch passes out of the body unchanged.

I cannot doubt that much harm has resulted from the almost exclusive attention which has latterly been bestowed on this element in infantile dyspepsia. It seems, not infrequently, as if the last word had been said, the last effort made, when malted food has been ordered. The question is no mere quibble. So long as we teach and act on the supposition that artificial food is injurious chiefly on account of the presence of starch, so long will the far more important factors continue to exist and to increase.

One of the most deplorable matters in this connection is the growing use of artificial foods. If prepared so that the starch is all or nearly all reduced, there is an idea abroad that they may be safely ordered and given; this idea is not alone confined to members of our own profession, but prevails largely among the public. As a result, much less cogent reasons now suffice than formerly to warrant the substitution of artificial food, either in part or entirely, for the breast-milk. Unfortunately, the privation of mother's milk is seldom the only privation which results from the practice of artificial feeding. Among the poorer classes—and it is essentially among these classes that the worst effects of artificial feeding are seen—deprivation of the mother's milk means deprivation of a mother's care, of the thousand and one little attentions which are as essential as suckling to a delicate infant. Quite irrespective of the diet itself, artificial food needs immense care in its modes of preparation, and I find that the troubles which are attributed to this kind of food, as often as not depend on its faulty preparation and administration. Not in this particular only are the mothers wanting in experience and knowledge. In poor homes, where life is a perpetual scramble, a veritable struggle for existence, there can be very little of that home-teaching which is such an important element in successful housekeeping in better stations of life; the girls grow up, marry, and become mothers without having been

taught any of the duties which pertain to motherhood. Among the better classes there is less mortality among the infants, for all the conditions of life are better. Nevertheless, there are many weakly, athreptic, and artificially-fed children even among the richer classes, for the congenital debilities of which I have spoken obtain also among these classes; after birth, however, the children, being much better cared for, gradually overcome this debility, and finally grow up notwithstanding.

The advantages of suckling do not rest entirely with the infant. Besides the popular tradition that a woman does not generally conceive while suckling—a tradition I hold to be well founded—it is clearly advantageous to the mammary glands that their function should be allowed to go on in a normal manner; lactation should come to an end after parturition as gradually as it develops into activity during pregnancy. Rapid child-bearing is very debilitating; this is especially the case among poor, overworked, underfed women, and, in my opinion, is one of the most potent of the debilitating influences with which we have to deal in this connection. In a certain proportion of the cases, I find that mothers have adopted artificial feeding because they are not strong enough to nurse. I should like to raise this question, and learn the opinion of Fellows of the Society upon it. I have met with a few undoubted cases, where such a cause, in some shape or other, appeared to be operative; but the cases are certainly uncommon, and it may, I think, be justly asserted that the causes are preventable.

In my analysis I stated that in 35 per cent. of the cases the mothers were acting under medical advice in not suckling their children. Even if the cases be excluded in which there was some physical reason to necessitate such a course, still the proportion of cases is large in which mothers desist from suckling with the consent of their medical advisers; and I am inclined to think that the habit of not suckling is largely on the increase—that slighter causes suffice to justify it now than formerly. Among reasons given and accepted as sufficient are the following—tuberculosis or syphilis in the mother. For myself, I may say that I have never met with a case in which a mother has given any constitutional disease to her own offspring through suckling it. As regards tuberculosis—a very transmissible disease in some families—it would be difficult to prove that it was conveyed by suckling the infant. Surely tendencies to a disease are much more likely to be derived from the far more intimate relation between the mother and foetus *in utero* than from suckling. As regards syphilis, Colles's law is not known to have any exception.

Not so many years ago, before these artificial foods had been invented, wet nurses were in great request. Such an arrangement was admirable when the supply of milk was sufficient both for the child and the nursing, and when both were allowed to partake of it; but it was disastrous when the child had to give place to the nursing, as was too often the case. But other evils and misfortunes than this tended largely to bring wet-nursing into disuse, namely, the danger of conveying disease either from the foster-mother to the child, or *vice versa*. I am inclined to think that it was this occasional conveyance of disease to or from a suckling infant which is responsible for the wide-spread belief that certain dyscrasias or constitutional conditions may be conveyed by a mother to her child through the breast-milk. My own experience, however, does not furnish me with a single example in point. The mother who bears a child will impress on it any constitutional peculiarity she herself possesses; it appears to me quite impossible that her milk can subsequently convey any further infection. Thus I think that to desist from suckling because the mother may be tubercular is a mistake as far as the child is concerned. The normal discharge of the maternal duties during a normal period, for reasons already alluded to, is clearly as advantageous to the mother as to the child.

I now approach the end of my thesis. The Fellows of the Society will see, from what has preceded, how I have been gradually led to change my views, and have come to regard infantile athrepsia not as the result of artificial feeding, least of all as the result of starch-containing foods, but as a congenital condition—a condition due to the untoward surroundings and mode of life of their parents.

As to the remedies for such conditions, I can do no more than just hint at them. They must be curative and preventive. I will not enter on the very large subject of foods and of diet for such children. Clearly there can be no hard-and-fast line, for there is a strong personal element in each individual case. Briefly, I should say, urge a mother to suckle, entirely if she can, or in part, especially when the child is weakly, and while the child is young; in other than breast-milk must be used, be careful to have it fresh and good and adequately diluted. If a child thrive on milk, so much the better—let well alone; but if artificial food must be added, insist on some simple

food, in moderate quantity, carefully prepared and administered, rather than upon some highly elaborated and largely advertised nostrum of the exact nature of which you are ignorant. Let it be remembered that fresh foods are far better than prepared foods, and that the processes of pancreatising and malting tend rather to destroy this freshness.

As regards preventive measures, seeing that I attribute far more influence to the congenital debility and home surroundings of these children than to starch-foods, it will be obvious in what way I should seek to lessen not only the amount of this infantile marasmus, but also the causes which lead to it. So long as adverse conditions of life persist, so long will be born marasmic and wasted infants. For such cases the conversion of the few grains of unaltered starch into dextrose, which each individual child daily consumes, will continue to prove a mere delusion, and be utterly inadequate to affect the question one way or another. Our sanitary inspectors would pronounce absolutely against the wholesomeness of milk produced by cows fed in such places as are occupied in every large town by crowds of child-bearing women, and would condemn the places as unfit for the rearing of cattle intended for human food.

Has not the time come for a reconsideration of the starch dogma, and for a protest, by the whole profession, against the continuation of a system of local government which permits human beings to be bred, born to live and die in holes long since declared unfit for the animals on which they feed? It seems doubtful what will be done with the funds now being collected all over the country, and known as the Women's Jubilee Offering. Can a more worthy object be imagined than the inauguration of conditions of life and living, more suitable than at present obtain, for thousands of the mothers, wives, and children of the poorer classes in most of the large cities and towns of wealthy England?

ON THE REFRACTIVE INDICES OF SOME PATHOLOGICAL FLUIDS.

By C. A. MAC MUNN, M.A., M.D.DUB., F.C.S., Wolverhampton.

IN the hope that an examination of the refractive indices of various pathological liquids would help as a means of distinguishing them from each other, I have made a series of observations on this subject.

I may say, however, that I have not arrived at any very definite result from a utilitarian point of view; still, it is possible that, by-and-bye, the calculation of the refractive index, taken in connection with other facts, may be found useful in the diagnosis of pathological liquids. It is for that reason that I venture to publish these preliminary results, and I regret that I have not been able to tabulate a more extensive series of measurements. For the specimens examined I have to thank my friends Dr. Saundby, of Birmingham, and Dr. Batterham, late House-Surgeon at the Wolverhampton Hospital, now of St. Leonard's. I may refresh the memory of any one who may care to look at these figures, and who may happen to have forgotten his "Physics," by briefly showing how to get the refractive index of a liquid. The index of refraction of a prism is the ratio of the sines of the angles of incidence and refraction¹; or, if μ = refractive index, A = angle of prism, i = difference between direct reading and deviation reading, then we have

$$(1) \quad \mu = \frac{\sin \frac{1}{2}(A + i)}{\sin \frac{1}{2}A}.$$

In the case of liquids, these are enclosed in a hollow glass prism, so constructed that, when filled with the liquid, the refracting angle of the latter shall be a certain angle, generally 60°. My hollow prism was made by Browning, of 63, Strand. A spectroscope, capable of being used as a spectrometer, is necessary; and I may say at once that the ordinary chemical spectroscopes, which are advertised as being fitted for the calculation of refractive indices, are generally useless for the purpose, owing to their prism tables being fixed; for the prism has to be set at the minimum angle of deviation in the case of each liquid examined. In Hilger's spectroscopes, the prism table is always made movable for this purpose. I need not here describe how to get the direct reading of the slit, and how to get the deviation reading when the prism is set at the minimum angle of deviation, as full directions for the adjustment of a spectrometer will be found in Glazebrook and Shaw's *Practical Physics*, and in the *Physical Optics* of the former

¹ "If a ray of homogeneous light fall on a refracting medium at an angle of incidence ϕ , the angle of refraction being ϕ' , then the ratio $\frac{\sin \phi}{\sin \phi'}$ is constant for all values of ϕ , and is the refractive index for light of the given refrangibility going from the first to the second medium." (Glazebrook and Shaw.)