

be provided where we can send babies that are destitute and require immediate care. I think the infants' asylum or hospital is valuable just in proportion to what is put into it. It is of value just in proportion to the amount of soul and brains put into it. If you want results you must have a technic that provides for asepsis and cleanliness, good food and good care. This must be carried out with determination, and in the end you will save a goodly proportion of your children. In boarding-out cases, the result depends very largely on the character of the women who receive the patients. I have seen both ways tried. In the boarding-out system very often it is a mercenary matter with the women who take the babies. So far as wet-nurses are concerned, it has been said that an infants' hospital has no more right to exist without the wet-nurse than the adults' hospital without an operating room. I think that is true. If you desire to reduce the infant mortality, wet-nurses are absolutely necessary, especially in the summer when the mortality is high. In our own hospital in Chicago we have as many wet-nurses as we need. We found we could train these women to produce large quantities of milk. They milk the breasts and produce several quarts per day. As to the prevention of infection I think very often our technic needs to be perfected. It seems to me we are not careful enough about our hands, and sometimes the nurses infect a child. It all comes to this, that we must educate the educators, particularly physicians and nurses. Mothers and nurses should be taught how easy it is to carry infection from one child to another; not only vulvovaginitis, but a host of other diseases. Each baby ought to have its own individual property, its own toilet articles, its own powder box, even its own thermometer. Another important thing is the feeding of children when they first come to the hospital. I think we have gone too far in the matter of starvation of babies. I think that when a baby is brought in pinched, blue and cold and is given barley water for a prolonged period his weight-curve goes down and if he does not actually starve, at least he falls a ready victim to infection. I believe that starvation is an important element not only in causing the immediate death of the infant but indirectly predisposes to death from infection. Another matter of importance is the question of cathartics. I am convinced that many of these babies are physicked sick. If they have had a cathartic on admission and the intestinal tract is clean, what is the sense in giving them continued cathartics? I think the matter of starvation and the matter of over-catharsis should be emphasized, because at present they are often applied in a routine way without due reference to the condition of the patient.

Dr. T. C. McCLEAVE, Berkeley, Cal.: Dr. Porter omitted to mention a very important feature of the work in San Francisco. This work was undertaken about two years ago. The mortality under the old system was about 40 per cent. and during the first year under the boarding-out system it dropped to 20 per cent. Then, an organization in the city making it possible for these children to be given certified milk, the mortality dropped in the second year to what it now is, about 2 per cent. Dr. Southworth spoke of clean milk. I think the meaning of that word "clean" is not always clear. In the feeding of infants and also of adults sick with various diseases, we know the wonderful change that results from putting the individual on certified milk. Therefore I want to urge on you particularly that you turn more and more to the use of certified milk. We have in California a strong organization of milk commissions, and we have a constantly increasing demand for certified milk. We are engaged in a vigorous propaganda among the laity for certified milk, as well as among the profession, but it is unfortunately true that it is often easier to get a response from the layman than from the physician.

Dr. JESSIE MCGAVIN, Portland, Ore.: I do think that one of the most important things is to see that the nurse carries out the physician's orders. It means a constant looking after the nurses until they are thoroughly trained, and when the nurse once understands that you are a crank, and that your orders must be carried out, you will save more of your babies. I lost one baby by neglect on the part of the nurse in the matter of feeding. In regard to contagious cases, in one instance

I found a contagious hospital and a general hospital adjoining and the place simply swarming with flies. We need to educate the hospitals in these conditions. As to pure milk, in Portland we have had one epidemic with a very high mortality as a result of dirty milk. All physicians were losing cases. We have had a fight for pure milk and as a result our mortality is lessened.

Dr. T. S. SOUTHWORTH, New York: Perhaps in some sections of the country the boarding-out system can be employed exclusively, but as I see conditions in the East it will be impossible for a long time to come. The sectarian organizations will be loth to give up their institutions. We still have a considerable field for improvement in our institutions and what I have said applies also largely to babies' hospitals.* I recently saw a statement to the effect that being a baby should be classed as an extra hazardous occupation, and it is very true. I did not refer to the glass partitions, for such partitions are valuable just so far as you can depend on your nurses. The glass partition is merely a danger sign board. Speaking of food, we have certainly need of milk which is clean. However, we must not only have suitable milk, but it must be used in the right way. There has been too much talk in this country about the saving of life by pasteurization alone. As to the limitation of infections, reference has been made to the danger of the patient's bringing in infectious diseases on admission. I admit this is a serious matter, but a great deal of infection is introduced into the institution by the visits of parents or relatives. The outbreaks of the ordinary infectious diseases in the wards are directly proportionate to the number of friends allowed to come to see the children. Often a parent will come directly from the bed-side of a child sick with scarlet fever or other infectious disease.

INFLUENCE OF SUMMER HEAT ON DIARRHEAL DISEASES *

I. A. ABT, M.D.
CHICAGO

A first glance at infant-mortality tables demonstrates the fact that the greatest death-rate occurs from the gastro-intestinal diseases during summer. Dr. W. D. Booker, in the presidential address before the American Pediatric Society in 1901, reviewed the early literature on this subject. Dr. Booker says that the records show that in about the middle of the eighteenth century there occurred along the Atlantic coast of North America a serious disease characterized especially by vomiting and diarrhea and was confined almost exclusively to children in the first two years of life. Its incidence was limited almost to the summer months and it appeared each year in an epidemic form, with such regularity that it was looked for as an annual visitor. In 1777, Benjamin Rush read a paper entitled "An Inquiry Into the Cause and Care of Cholera Infantum." He gave a description of the stools, etiology and treatment of the disease. He denied the etiologic importance of dentition, worms and summer fruits, and he thought that the disease was similar to cholera and remitting fever in adults. He did not attempt to explain any relation of the disease to atmospheric heat, but contented himself by saying that the disease seldom occurred in Philadelphia until the middle of June and generally continued until the middle of September, and that its intensity and duration were always proportionate to the heat of the weather. The first indication for treatment, he thought, was to evacuate the stomach by emetics, followed by an abundance of water or tea, or an infusion of blueberries. He also suggested enemas, plasters to the abdomen, and

* Read in the Section on Diseases of Children of the American Medical Association, at the Sixty-Second Annual Session, held at Los Angeles, June, 1911.

internally he recommended port wine or white wine. The best results were obtained when a little water was mixed with the wine. He considered baths very important, and he said his principal dependence had been placed, for many years on country air. As prophylactic treatment he recommended, (1) a daily cold bath, (2) clothing which was appropriate to the conditions of the weather, (3) removal of the children from the city to the country. Rush says: "I have never known but one instance of a child being affected with this disease, who has been carried into the country in order to avoid it."

It was thought at this time that the disease was peculiar to America as, apparently, the condition had not been described in other countries. It was thought to be due to the character of our climate, to the severity, frequency and suddenness of the change of temperature and to the sudden transition from winter to summer without the intervention of a gradually opening spring.

The mode of action of atmospheric heat in causing cholera infantum was the subject of controversy and various theories were advanced in explanation of it. These were for the most part based on the prevailing conception of the existence of a cutaneo-hepatic sympathy. By some, the heat of summer was supposed to exhaust the tone of the skin or to disturb its healthy action and thus determine an undue quantity of blood into the abdominal viscera, causing a congestion of these organs. Booker goes on to say that others thought that the effect of protracted heat led to a disturbance of the digestive organs because of some deranged condition of the exterior surface of the body. In this way the tone and energy of the stomach became impaired and consequently the system became more accessible to impressions exercised by external agents and its resistance to them became diminished.

So far as the geographical distribution of the disease is concerned, it is noted that in the extreme north or south, the sick-rate and the death-rate are low. In North America, the middle and western states contribute the largest numbers in the mortality figures. As one approaches Canada, the numbers diminish; in the South and Southwest, we are told, the disease is less common. It is rare in the tropics, as has been observed in Brazil and in the tropical and subtropical regions of Asia and Africa. The same points in vital statistics apply to European countries. The summer diarrheal diseases occur most frequently in the large centers of population, particularly the industrial centers and in those regions where artificial feeding is commonly employed, and where the climatic conditions are such that the summers are relatively hot and the winters cold and severe.

The older American physicians, particularly Rush, thought that the hot weather was the most important factor in the etiology. He advised taking the child from the city to the country. In the course of time, other writers thought that the hot weather alone was an insufficient cause. Some said that the summer diarrhea of infants was a species of Asiatic cholera; others, that it was a form of malaria. In America, some writers considered it akin to yellow fever and others thought it was due to an indefinite miasm. Virchow thought that the condition stood in some relation to the water-supply and drainage, or to the surface water, adopting the view Pettenkofer applied to typhoid fever. In short, the older views as to the etiology of summer cholera considered that the disease was due to exogenous agents, the action of which was favored by the external heat, the latter acting either directly or through the food.

When the bacteriologic era began the attempt was made to find specific microorganisms. Escherich differentiated an exogenous infection of the intestines, the so-called streptococcus enteritis, and an endogenous infection, a process which ran its course as an auto-infection, or an infection of the chyme. Escherich thought that the disease might be produced by infected cow's milk, microorganisms gaining access to the milk shortly after milking, or that endogenous decomposition occurred as the result of already sick or enfeebled children receiving such milk. In the intestinal canal, irritating organic acids were believed to be produced, or alkaloidal products, ptomaines, which produced diarrhea and nervous symptoms. No specific microorganism was found, but various forms, he thought, were capable of producing such a reaction. Other authors described epidemics of summer diarrhea, particularly in hospitals and asylums, and naturally thought that the epidemics were bacterial in origin. Baginsky, who failed to find a specific microorganism, came to the conclusion that the saprophytic bacteria in the milk were capable of producing poisonous peptones from the proteids. He thought that indol, phenol and ammonia gained access to the lymph and blood and produced toxemia. It is a well-known fact that bacteria multiply rapidly in milk during hot weather and it was thought that this was the sole cause. This led to sterilization and pasteurization of milk. Flugge and all the other authors who have described the poisonous effects of milk in producing summer cholera have compared this condition to meat-poisoning. But this comparison does not hold in all details. Meat-poisoning and sausage-poisoning affect all persons, whether they be children or adults, who have partaken of this food. It might be said that children are more susceptible than adults, though as a rule not all children who partake of supposedly infected milk fall ill. On the other hand, Vaughn has described epidemics of poisoning by ice-cream and cheese, affecting every person who partook of the food. They fell severely ill with vomiting, diarrhea, pain, weak, irregular pulse and great pallor or cyanosis. He isolated a poisonous substance which he called tyrotoxin. No further argument need be advanced that the summer complaint is not similar to tyrotoxin poisoning.

Czerny and Kellar believe that summer diarrheas are for the most part the result of exogenous fat-decomposition due to the presence of bacteria; they think that this condition is related to the heat of the summer only in so far as the increased number of microorganisms are rendered more active. But there are numerous objections to this theory. If it is true that bacterially acidified milk is toxic, why is buttermilk devoid of toxicity and why so acceptable, even to the sick infant?

In brief, it may be said:

1. The bacterial toxicity of milk is not proved.
2. On the other hand, a bacteria-laden milk is more likely to produce diarrhea than milk poor in bacteria.
3. In those cases in which a toxic product has been isolated from milk or meat, nearly all persons who took such food were rendered severely ill. An analogy of this condition with summer diarrhea is not tenable.
4. It is very probable that bacteria play a part in summer diarrhea, but they do not act on the milk before it is taken into the body (exogenous), but more likely cause fermentation after the food has been received in the gastro-intestinal tract (endogenous).

The bacterial explanation for the summer diarrhea is not sufficient. Why the excessively high mortality only

during the hot weather? How may we explain the fact that the hotter the summer, the greater is the sick-rate and the death-rate among infants?

If during a hot day one examines the conditions under which the infants live in homes of the poor, one will be impressed by the fact that the temperature indoors exceeds the temperature outdoors; that at night, if the temperature outdoors has fallen considerably, the temperature indoors is considerably higher. The babies are frequently put to bed overclothed and sometimes excessively covered with bedding. If the infant's temperature be taken even before diarrhea has set in, he is frequently found to have 100 to 101 F. Many writers have looked on this condition as one of insolation or heat-stroke.

The interesting fact has been brought out that seven times as many artificially fed children, as breast-fed, die in summer. The bottle-baby is at greater peril in summer than at any other period of the year. No matter what theory may be advanced, the fact that breast-fed children show greater resistance and immunity than bottle-fed children cannot be denied. Those infants who have previously suffered from gastro-intestinal derangement, or even those who are convalescing from some alimentary disorder, are likely to show a hyperthermia on the advent of hot weather. This is undoubtedly due to the fact that the heat-regulating mechanism is much more unstable in children suffering from digestive disorders, and we may say that such children are predisposed to heat-stroke.

It is not possible to say in what manner the heat affects the body of the child, but it seems that the infant's resistance is lowered and that injuries by food are readily produced. It is not known whether the heat produces changes in the enzymes of the digestive tube, or whether the bacteria make toxic products or irritating acids in the gastro-intestinal tract. It is possible that the epithelium of the gastro-intestinal tract is itself damaged. It would be unscientific to say that bacterially decomposed milk has no causal part in producing summer diarrhea; but on the other hand, proof is insufficient to permit us to say that bacteria play the single rôle. It would seem that the increased heat, particularly of the home, is an important etiologic factor. Whether this be due directly to heat-stroke or whether it be, in the sense of Finkelstein, a diminished tolerance for food and the possibility of injury by food, must remain for the present an open question.

Perhaps this latter point will explain the difference in death-rate between breast-fed and hand-fed infants. The tolerance for breast-milk is always greater than the tolerance for cow's milk, and similarly, immunity and resistance is greater in breast-fed than hand-fed children. A word should be said against the practice of keeping sick infants warmly dressed and excessively covered during the hot weather. A cool bath and the out-of-doors temperature are important indications in treatment.

The occurrence of high sick-rate and death-rate during the summer cannot be explained by a single cause. We believe that the condition is due to a combination of causes. Infected milk has a deleterious influence, but it must be considered along with the direct influence of heat, especially the excessive warmth of the home. It would be unwise to deprecate the advantage of sanitary milk, but the problems of hygienic housing, the avoidance of overclothing, the importance of taking the child out of doors and of frequent bathing are important points which cannot be overestimated in consideration of the summer diarrheal diseases of infants.

Finkelstein, after discussing the bacterial theory of summer diarrhea, thinks that infection occurs in those cases in which the gastro-intestinal cells have been previously damaged. He is willing to admit that delicate children who ingest bacteria-laden milk are liable to have gastro-intestinal infection or that damage may be produced by preformed acids and peptones in the milk. The two arguments in favor of infected or decomposed milk as cause of gastro-intestinal disorders were: the increased morbidity and mortality during the summer, and the fact that the greatest proportion of those that sickened and died were bottle-fed infants, while breast-fed children were for the most part immune. But Finkelstein thinks this insufficient. He thinks that the majority of infants who sicken or die during summer time are injured by the heat. The cases begin acutely, show symptoms of hyperpyrexia and the trouble may be cured or even prevented by reduction of the patient's temperature or by providing cool, sanitary living conditions. The heat lowers the individual tolerance of the infant and predisposes him to gastro-intestinal disorders which are likely to assume great severity.

If it is asked why breast-fed children enjoy immunity against the injuries produced by excessive heat, it may be answered that the child suffering from digestive disturbances has less resistance to heat than a normal child, since most breast-fed children are well, and a goodly number of hand-fed children are more or less ill, the conclusion is obvious.

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ABSTRACT OF DISCUSSION

DR. JOHN W. FOSS, Phoenix, Ariz.: In Phoenix we have probably the highest dry-bulb temperature and the lowest wet-bulb temperature during the summer, of any place in the world. We have no acute dysentery in children in the summer. We consider the summer the healthiest season for children. In fact, we have very little sickness of any kind among children at that time. So I think this question of heat is practically eliminated as the cause of this class of diseases in children, judging from the experience we have had in our climate. There are few places which have less physical discomfort from heat during the summer than Phoenix. As an illustration of this fact, 15 per cent. of humidity with the thermometer at 106 F. at Phoenix is as comfortable as 70 is at Chicago ordinarily, or the dry-bulb thermometer would have to register 133 at Phoenix to cause as much discomfort as 90 per cent. of humidity with the thermometer registering 98 F. at Chicago. It is probably this remarkable climatic condition which is so conducive to the health of children. Our experience would seem to prove that the mere question of heat has nothing to do with these diseases, especially at Phoenix. The wet-bulb rarely goes above 72 F. in Phoenix in the summer time, while the dry-bulb will sometimes run as high as 110. Evaporation and radiation are very rapid here on account of the pure dry air, moderate wind velocity and varying atmospheric pressure.

DR. M. A. WEEMS, Columbia, Tex.: I think this question can be explained by the humidity. In Arizona at the time the air is so dry the evaporation from the body of the child is so rapid that it keeps the body temperature low even in extremely hot weather.

DR. W. V. C. FRANCIS, Los Angeles: I think one factor in the etiology of summer diarrheas is very obvious, in that the condition occurs in large cities. In Los Angeles we have none of the really poor and none of the overcrowding that you have who live in large cities. I believe a large factor in the diarrheas of children is the lack of fresh air. If you remove the slum districts and the overcrowding, you will do away with a lot of the summer diarrheas and deaths.

DR. FRANK P. GEGENBACH, Denver: Undoubtedly there are many factors to be considered in the cause of summer diarrheas in children, but I am inclined to believe with Dr. Abt

that heat does have something to do with it. Recently we had an early and sudden hot spell for Denver, and in my own private practice I saw distinct disturbances among the babies. This is an instance in which the ideas of Dr. Francis do not apply, for these babies were in well-to-do families, well provided for, well cared for, and had plenty of fresh air. I think that some depressive factor in connection with this hot spell certainly did disturb the babies. Probably in hot weather the babies cannot stand as rich a food, as high in fat, and it disagrees with them. Often it is not necessary to take them off the food, but if I take off the cream and give skim-milk mixtures they rapidly improve.

DR. FRANCES M. ALLEN, San Diego, Cal.: In my experience of six-years in Illinois in a children's institution, the children were cared for by mothers who boarded the children for \$2.50 or \$3.00 a week each, and our results showed that we could keep our mortality low, except during the hot spells. During five years we had a high mortality only during August, during the sixth year, in July.

DR. L. T. ROYSTER, Norfolk, Va.: To me this is one of the most interesting and difficult phases of the diarrhea question. I come from the Atlantic coast, where the humidity is high, and where a temperature of 88 F. is very uncomfortable, while a temperature of 100 F. out here I have not found at all uncomfortable. In April the temperature rises considerably; then during the first two weeks of May we have a considerably cooler spell, and then the temperature shoots up and the minute the temperature goes up the trouble begins. I can almost predict the number of my calls by the reports of the weather bureau. In June we have a high death-rate. In July and August we have a decreased mortality, so I believe the humidity must have something to do with it. Another interesting fact is this: I have practically no consultations in summer diarrheas from the country. Yet there the temperature is just as great and the humidity is just as great; but I practically never see a child from two miles out with a summer diarrhea. Again, I practically never see a case among breast-fed infants. If a sick child is brought to me in the morning and it is taken for a boat ride for the day, it will come back in the evening 95 per cent. better. In fact, we have tried to train the mothers to take the children to the sanitarium when they first become sick, without waiting to see a physician, even, and it is really surprising how rapidly they improve, even though the institution is located but 50 yards from the shore. Another thing is the character of the discharges. These vary from year to year. One year there will be a watery discharge with the same prostration and again the next year we may have a remarkable number of dysenteric discharges, so that from year to year the discharges are markedly different.

DR. I. A. ABT, Chicago: I think the fact has been brought out by investigators, even as far back as the time of Benjamin Rush, that summer diarrheas are more prevalent in the temperate regions, while further south and even in the tropics, the disease is scarcely known. In my own part of the country there is a striking relationship, I am sure, between the condition of the weather and the summer diarrhea. I think anybody who has lived east of the Mississippi River will not doubt that. Why New Orleans should have a low death-rate with an increase of temperature I confess that at this moment I am unable to see. I am not sure that the heat is the only factor, but it does seem that all over the world where cases are being studied and where men are trying to solve this problem, during July and August there is the highest death-rate. It is true the condition is more common in the cities than in the country, but the condition is not confined to the cities by any means. I brought up this question because it seems to me we ought to study the cause of these summer diarrheas. The war that is being waged all over the world to save babies needs some help from the educator. We urge that every effort be made to save babies and I think it is very important that we attempt to arrive at some definite conclusion as to the cause of trouble. I would suggest that a committee be appointed from the various communities and that this committee be asked to keep a record of their observations and that they submit a report based on such records.

TWIN PREGNANCY IN UTERUS BICORNIS

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ST. LOUIS

In view of the rarity of pregnancy in the uterus bicornis, with viable fetus, I think the following case of sufficient interest to report. The patient was referred to me by Dr. George M. Tuttle.

History.—Mrs. E. B. C., a cultivated American woman, aged 34, was seen by me in March, 1911. She was then about four months pregnant and very uncomfortable, having pain much of the time from what appeared to be uterine contractions, also much pain due to attacks of acute indigestion. The bladder was very irritable and for about three months she had had to get up three or four times at night to urinate.

The patient had one child living, a girl 5 years old, in perfect health; this child was born prematurely at eight months and had thriven from birth. One other baby had been born prematurely at about seven and a half months and had lived seventeen months, dying of some intestinal infection. With each former pregnancy, Mrs. C. had had similar pain and discomfort, and all efforts to prevent premature labor failed.

Examination.—The patient was apparently in good general condition but somewhat nervous over the prospect in store for her. She was about four months pregnant. The fetal movements could not be felt; the heart-beat could not be heard. There was unquestionably a notch in the upper middle portion of the uterus, but no importance was attached to this finding. A mass could be made out on either side. It was now learned that, whereas in previous pregnancies there had been movements and contraction pains only on the right side, they were now present on both. The urine was examined repeatedly and was at all times normal.

With careful dietary and some medication the patient went along more or less uncomfortably (mostly more) for two months. She was up for a time every day but went out very little. Later examinations convinced me that there was something radically out of the way in this case. Movements and heart-beat could be readily made out on the right side but never on the left; the separate masses could be easily distinguished. June 3, the threatened miscarriage became imminent; sedatives had no effect. True labor pains began and on my second visit dilatation was well advanced. After the patient had progressed favorably through the night, the pains unaccountably stopped early in the morning. Dilatation was then complete and the membranes were ruptured. It was now found that the umbilical cord was through the pelvic inlet and the head beside and above it was not engaged. The cord was pulsating and the child and the mother were in good condition; as yet it could not be certainly demonstrated that twins were present. Dr. Tuttle saw the patient at this time and thought twins a strong probability. Although it was probable that interference would be necessary it was decided to wait a while longer.

Delivery.—That evening artificial delivery was performed under chloroform anesthesia. Dr. H. J. Storrs was called in consultation and agreed to the necessity. He suggested the possibility of a twin pregnancy in a bicornuate uterus. Version was performed and one living and one dead child delivered. A septum divided the uterus to a point well below the umbilicus and a fetus occupied each side; both were vertex presentations. The placenta of the dead child showed the site of the hemorrhage that had provoked the miscarriage. The uterus contracted promptly and then showed two separate fundi, each larger than the fist, and separated by a notch so deep that the clenched fist easily rested in it—a typical uterus bicornis. There was no appreciable difference in the size of the two horns.

Recovery.—Convalescence was uneventful, the patient sitting up on the eighth day. Involution proceeded normally, and after two months a vaginal examination showed clearly the two cornua, each about the size of the normal fundus and separated from each other enough to allow the two examining fingers between them. The notch extended nearly to the supravaginal portion of the cervix.

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