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FISKE FUND PRIZE DISSERTATIONS OF THE RHODE
ISLAND MEDICAL SOCIETY.

CHOLERA INFANTUM,

ITS

CAUSES AND TREATMENT.

BY

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Duo in Morbis præstanda sunt; adjuvare, aut saltem non nocere.—HIPPOCRATES. EPIDEM. TRANS.



D. CLAPP, JR.—184 WASHINGTON STREET.

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At a meeting of the FISKE FUND TRUSTEES, held at *Newport, R. I.*, on the 27th day of June, A. D. 1837, it was decided that the Dissertation bearing the motto, "*Duo in morbis prastanda sunt; adjuvare, aut saltem non nocere,*" and which, on breaking the seal of the accompanying letter, was found to be written by David King, Jr. M.D., of Newport, was entitled to the premium of *forty dollars* offered for the best Dissertation on the question, "What are the causes and nature of Cholera Infantum, and the best mode of treatment to be employed therein?" In awarding the premium to this Dissertation, neither the Trustees nor the Rhode Island Medical Society hold themselves responsible for the doctrines herein inculcated, treatment recommended, or opinions advanced.

Signed,

{ CHARLES E. ELDRIDGE,
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DISSERTATION.

“What are the causes and nature of CHOLERA INFANTUM, and the best mode of treatment to be employed therein?”

CHOLERA INFANTUM has not hitherto received that attention which its prevalence and fatality demand. Its literary history includes only the recorded experience of a few medical observers, whose researches tend more to illustrate the symptoms and progress of the disease, than to unfold its pathological states and relations. Its attacks are almost entirely confined to teething children, especially during the period which intervenes between their fifth and twentieth month. It prevails, during the warm season, in the large towns of Europe and the United States, and in climates within the tropics. In the United States, its prevalence is mostly confined to large and crowded cities, between the months of May and October. In the country it seldom makes its appearance, except occasionally in villages where the houses are very compact, or in localities rendered unhealthy by their moisture and low situation. It commences in the southern States, the Carolinas, Alabama, Louisiana and Mississippi, in April or May; in Pennsylvania, Maryland, Virginia, Kentucky and Ohio, in June; in New England, in August, where the disease is most frequent in September.

Its fatality is very marked; it being about one fourth of all the deaths among children in our large cities. Its ravages seem to increase, as we approach towards the equator. In the city of Philadelphia, the average number of deaths, among children under two years of age, is two hundred annually. In 1823, two hundred and fifty children died of cholera infantum in Baltimore. In Cincinnati, its fatality is very great. Dr. Cartwright remarks, that the traveller, on visiting the burial places of that city, is astonished at the immense number of children's graves.

Cholera infantum most commonly commences with vomitings and purgings, which are associated with high febrile excitement. Diarrhœa, in some instances, precedes, for several days, the occurrence of vomiting, but most frequently they occur simultaneously, or alternate with each

other. Functional disturbance of the nervous system, and slight irritation of the mucous membrane of the alimentary canal, usually precede the vomitings and purgings. The matters vomited consist, at first, of a greenish or yellow fluid, and afterwards of a frothy mucus, and of drinks that may be given to the patient. The alvine discharges occur from three to twenty times in the course of twenty-four hours. The dejections vary in appearance, sometimes consisting of an abundant secretion of mucus, slightly tinged with bile, and mixed with pieces of curd, if the child have been fed on milk; sometimes they consist of a copious exhalation of serum, containing small portions of mucus; sometimes they are slimy and bloody, without any tinge of bile. The fæcal matter is mostly retained in the intestines; small portions of it occasionally escape with the other discharges. The discharges want the true fæcal smell; they are, mostly, sour or putrid, like water in which putrid meat has been washed. As the disease advances, the secretion of bile is suspended.

This irritability of the alimentary canal is accompanied by a remittent fever, whose exacerbations are highest in the evening. The patient is restless and irritable. The pulse is small, quick, and frequent, sometimes corded. The thirst is intense, in all stages of the disease. The tongue is covered at first with a thin white fur, but gradually acquires a dry, red, and polished appearance, particularly when the disease is prolonged.

The patient evidently experiences the same indescribable distress about the epigastric and præcordial regions, which is felt in the cholera of adults. In severe cases, spasms occur in the abdominal muscles, and in the muscles of the extremities. The patient draws up his feet, and is uneasy in every position.

The brain is, early, sympathetically affected, as indicated by a tendency to stupor or delirium. The eyes are either fierce, or dull and inanimate, and the patient sleeps with them half open. The head and abdomen are hot, while the extremities are cold.

In the most violent form of the disease, the vital powers are suddenly exhausted, the extremities become cold and damp, the surface of the body collapsed, and death ensues within a single day. Fatal exhaustion rarely occurs, however, before the fifth or sixth day.

In many cases, the vomiting and severe symptoms gradually diminish, a general moisture of the skin and an equal distribution of temperature ensue, and convalescence begins in five or six days from the commencement. If convalescence do not occur in a few days, rapid emaciation takes place. The whole adipose substance appears to be absorbed. The skin is dry and harsh; on the forehead it appears tight, as if bound to

the bone ; on the inner part of the thighs, and over the abdomen, it has a wilted appearance. The countenance is contracted, and of a deadly paleness. The nose is sharp, and the lips thin and shrivelled, as in old age. The extremities are cold and damp, and the head and abdomen preternaturally hot. The thirst is excessive, and the desire of cold drinks constant. The irritability of the stomach is so great, that cold water, the only drink which the patient does not refuse, is retained but a few moments after being taken. The disease may continue thus for many weeks, and yet recovery may occur from such excessive exhaustion and emaciation.

Frequently, a fatal termination is produced by the affection of the brain, which assumes the form of acute hydrocephalus. The little patient rolls his head about when awake ; when asleep, the eyelids are half closed and the eyes turned up. He gradually sinks into a state of insensibility, so that, as noticed by Dr. Rush, flies alight on the eyes when open, without exciting a movement of the eyelids for their removal. Death generally occurs in a paroxysm of convulsions.

Another termination results in the more protracted forms of the complaint. The disease seems to fix with a firmer grasp upon the intestines. The alvine discharges are dark and offensive, and so acrid as to excoriate the parts about the anus. The function of digestion is suspended, and the ingesta pass through the intestines in an unaltered state. The thirst is excessive. Aphthæ appear on the tongue and inside of the cheeks, and purple spots on various parts of the skin. The face and feet become œdematous ; the abdomen tympanitic ; the patient dies in a comatose state.

Prognosis.—The prognosis is very uncertain in this disease. A favorable issue may be expected when the liver resumes its functions, and the alvine discharges assume a natural appearance. The renewed secretion of bile, causing dark bilious discharges ; a uniform moisture of the skin, and a natural temperature equally diffused over the surface of the body ; the cessation of the irritability of the stomach and bowels, of the fever, and cerebral disturbance, are among the favorable prognostics. An increase of the cerebral symptoms, of the restlessness and spasms ; convulsions, extreme nervous sensibility, or coma ; a small thready pulse ; hurried respiration ; constant vomiting ; watery, greasy, reddish, and dark flocculose discharges ; stools of pink-colored margin ; cold clammy surface, and haggard countenance, are among the principal unfavorable signs. Dr. Dewees notices, as fatal signs—the appearance upon the chest of a

crystalline eruption, consisting of an immense number of watery vesicles; live worms crawling from the throat, and the thrusting of the hand or fingers into the back part of the mouth, as if to remove something from the throat. Dr. Rush says, "An emaciation of the body to such a degree as that the bones come through the skin, livid spots, a singultus, convulsions, a strongly-marked Hippocratic countenance, and a sore mouth," generally precede the fatal termination of this disorder.

Diagnosis.—The disease can rarely be mistaken for other intestinal diseases of infancy. Dr. Jackson says that the disease has been sometimes confounded with an affection of children previous to the age of dentition; arising from some error in diet, or from general debility and indigestion, in the nurse; the alvine discharges being frequent, and consisting partly of fecal matter, and partly of mucus colored with green bile, of curdled milk, and a watery fluid. This disease is readily distinguished from cholera infantum, by the want of that constitutional disturbance which interrupts the growth and vigor of the body.

Causes of Cholera Infantum.—In the first place, this disease has a specific miasmatic cause. Most endemic maladies, probably, arise from some emanation from the soil, owing to the dissolution of animal and vegetable matter. We know not the nature of these miasms, because they are beyond the reach of our senses and the analyzing processes of art. It is probable, however, that, at first, the animal and vegetable matter is decomposed into atoms of effluvia; and that these atoms of effluvia enter, afterwards, into those peculiar combinations which constitute specific miasms. Our knowledge of the origin of febrile miasm consists, chiefly, in the established fact, that for its production are required a combination of four elements—animal or vegetable matter, atmospheric air, a high temperature, and water in a moderate quantity. But the circumstances of temperature and moisture, elevation, texture and depth of soil, which determine the specific form of the febrile miasm, are beyond the reach of our observation and experiment. We do not know all the combined causes required to produce "hepatitis on the coast of Coromandel, elephantiasis in Malabar, beriberi in Ceylon, Barbadoes leg in the Antilles, goitre among the Alps, the plica in Poland, cretinism in the Vallais," or cholera infantum in the large cities of the United States. The existence of the febrile miasm, producing cholera infantum, is known by its effects. It is confined to particular localities, supplied with materials for the production of miasm. Were the disease attributable to com-

mon causes, as heat, moisture, and atmospherical vicissitudes, this pestis infantum would be a pervading disease, through the whole range of the United States. But its great source is to be found, only, in our large cities, where heat, moisture, a semi-stagnant atmosphere, and filth, or animal and vegetable remains, spread over a large surface, readily produce the *malarious emanation*.

Dr. Eberle has offered two objections to the malarious origin of cholera infantum. 1st. Its occurrence is almost exclusively confined to the period during which the process of primary dentition is going on. 2d. In the eastern cities of America, particularly in Philadelphia, it often prevails extensively during the months of June and July, some time before the ordinary miasmatic diseases are wont to make their appearance in our climate. To the first objection, we answer, that it is not unphilosophical to suppose that a febrile miasm may be injurious during the first two years of infancy, and that the increased stability and firmness of the constitution may, afterwards, resist its deleterious effects. The second objection involves an assumption of knowledge to which medical science has not yet attained. We do not know the exact periods of time required for the production of different febrile miasms. The miasm of yellow fever requires the continuance of tropical heat, at least for a month.* The miasm of cholera infantum may require a less degree of heat, for a comparatively short period.

Among the concurrent causes of this disease, we may mention the age of the patient, dentition, high atmospherical temperature, impure air, atmospherical vicissitudes, and errors in diet, with premature weaning.

1st. *The Age of the Patient*.—The animal organism is, as yet, in the progress of development. The nervous system is in a state of growth, and undergoing those secret changes of nutrition, by which its organization is to be completed. The process of nutrition causes to be centred, there, a full supply of blood, and a high degree of vascular action. The mucous membranes are undoubtedly in a comparatively imperfect state, in regard to their organization. Their consistence is so soft as to be readily scraped off after death, in the form of a pulp. When their organization is completed, they probably possess sufficient tenacity to be dissected off as distinct membranes. The functions depending, for the regularity of their performance, on the condition of the several structures, are liable, at this period, from comparatively slight causes, to be exalted from a physiological to a pathological state. The

* Caldwell on Malaria.

vis conservatrix naturæ, the power, which, in the perfect state of the animal organism, maintains an equilibrium in the distribution of the vital forces, opposes, in the irritable state of infancy, but a feeble effort to the action of febrile miasm.

2d. *Dentition* is so marked an agent in the production of this disease, that some writers have thought it a necessary cause. But the fact that the cholera infantum occurs, occasionally, after the period of primary dentition, renders it unphilosophical to consider it in any other view than as a concurrent cause. Dentition, in some rare cases, causes no general disturbance of the system, and simply excites an increased secretion of saliva, and perhaps of the pancreatic fluid. In most cases, it causes a morbid irritability through the whole frame, and kindles disease in those structures which are in a state of growth, especially the nervous system and the mucous membranes. Its chief agency is exhibited in associating together diseases of the nervous centres with diseases of the alimentary canal. Hence in cholera infantum it acts by producing a primary cerebral irritation, and a consequent irritability of the stomach and bowels. Constitutional irritation from teething occurs, chiefly, during the period between the fifth and twentieth month. Hence the prevalence of cholera infantum during this period of infantile life.

3d. *High Atmospherical Temperature*.—This disease occurs, only, during the warm season in temperate regions. Its prevalence and fatality are very marked in warm climates. Dr. Dunglison, in his work on Hygiene, explains the morbid influence of an elevated temperature on the animal economy, in the following manner: “The constant evaporation by the cutaneous and pulmonary transpiration maintains the absorbents of the intestines in a state of irregular erethism, which predisposes them to a morbid condition.” High ranges of atmospheric temperature, without doubt, have a tendency to maintain the functions of the skin, the liver, and the absorbents of the intestinal canal, particularly the upper part, in a state of constant excitement. The pulmonary function, also, is not properly performed in high states of temperature. The blood, not undergoing its salutary changes in the lungs, becomes a powerful agent of disease. The morbid matters, retained in the blood from the imperfect exercise of the depurating organs, are carried, by the vascular system, to the seats of irritation, established by the concurrent causes of the disease.

4th. *Impure Air*.—The impure air of cities, independent of the specific miasm, predisposes the system to the disease. It acts through the medium of respiration, contaminating the blood, and lowering the general tone of the system. In the narrow lanes and alleys, and in the filthy and

crowded habitations, of our large cities, the morbid agency of impure air is seen in the great prevalence of this disease. Dr. Parrish has well described its effects. "Let any one take a walk, in a summer morning, through the thickly built lanes and alleys of Philadelphia, and he will be struck with the appearance of the children reclining their heads, as if exhausted, upon the breast of their mothers, with a pale and languid countenance, a cool and clammy skin, a shrunk neck, and other signs of debility, arising from their confinement, during the night, to close and hot apartments." The prevalence of an epidemic principle seems to increase the mortality of the disease. Thus, during the prevalence of the malignant cholera, the number of deaths from cholera infantum, in Philadelphia, was as follows, according to the tables of Dr. Emerson.

	June.	July.	August.	Total.
1831.	45	132	82	259
1832.	25	134	157	316

5th. *Atmospherical Vicissitudes.*—The infantile system, exhausted and irritated by heat, dentition, and impure air, is extremely susceptible to the influence of atmospherical impressions. The cutaneous exhalents, debilitated by over-excitement, fall readily into a state of collapse, on the sudden application of cold or moisture; especially at night, during the inaction of sleep. The suppression of the cutaneous function destroys the balance of the circulation, and determines the blood to the internal organs.

6th. *Errors in Diet.*—The digestive mucous membrane, from its delicate, and perhaps imperfect texture, is liable, during the period of dentition, to morbid action. Nature has specially protected it from irritation by two expedients: 1st. A secretion of mucus, which lines the internal surface of the alimentary canal. 2d. The milk of the mother, the blandest and most digestible nourishment. Premature weaning, by substituting an artificial diet for that which Nature has appropriated to the infant, produces febrile disturbance and irritation of the digestive mucous surface. Hence the diarrhoea of teething children often follows weaning at an improper age or season. The following valuable remarks, by Dr. Jackson, are worthy of attention. "Children are benefited by living principally on the breast for twelve months; their vigor is evidently impaired, in almost all cases, when they are nursed less than nine months. The safest period of the year for weaning, is from the middle of October to the middle of March; provided they be not weaned under ten months, after December; under eleven, after January; nor under twelve, after

February. Children who are weaned at the age of twelve months in March, are ordinarily safe; those who are weaned at this age in April are less so, one half of them suffering severely in the subsequent summer or autumn. In May the danger increases; and in the four subsequent months, if a child of any age be weaned, it will in most cases be very sick before the middle of the October ensuing.* In children, who have been weaned at the improper age and season, food of difficult digestion and overfeeding frequently cause disordered function of the digestive organs.

Pathology.—The pathology of this disease will be inferred from a consideration of the symptoms during life, and an examination of the lesions of structure, in fatal cases, after death. The following appearances were observed by Dr. James Jackson and Dr. John C. Warren, of Boston, from examinations made during a period of several years.

“The body is emaciated; often very much. In some cases the abdomen is full and tense, and especially about the region of the liver. The viscera of the thorax have been found in good order. In the abdomen, the liver has sometimes been found very large, so as to occupy two fifths of that cavity; but this viscus has not presented any other marks of disease, unless, indeed, it may, in one or two cases, have been rather more firm and solid than natural.” The gall-bladder, spleen and pancreas, have not been distinguished by any peculiar appearances. “The peritoneal coat of the intestines has, in its greater part, been found healthy; in some cases altogether so; but in most cases some few spots, or portions of it, have been discolored in consequence of a distention of the small vessels going to supply the internal membranes or coats. Also in one or two cases, an inflamed line has appeared on each of two contiguous folds of intestine, just above their line of contact. In every case marks of disease have been discovered on the mucous membrane. In the stomach there have usually been observed one or two small spots, of an irregular shape, in which the mucous membrane was red, inclining a little to a purple. The membrane in these places has not been much, if at all, swollen. The stomach is commonly lined with an adhesive mucus. In the duodenum there have invariably been found one or more spots, much larger than in the stomach, in which the mucous membrane has been considerably inflamed, and for the most part swollen. In almost every case, such an inflamed patch has been found at the very commencement of the duodenum. Other inflamed patches, varying in size, and corres-

ponding with the discolored portions of the peritoneal coat, have been seen in the small intestines in every case.”*

Dr. Dewees has found, in the small intestines, coagulable lymph spread over the surface, or in detached pieces. He notices an alteration of structure, from thickening of the coats of the intestine, reducing the calibre of the alimentary canal in the parts where it occurs.

Dr. Horner,† from some careful and accurate post-mortem examinations, infers that cholera infantum is a follicular, rather than an erythemoid inflammation—a disease of the innumerable mucous glands or follicles extended from one end to the other of the alimentary canal, rather than a common vascular or erythemoid inflammation. In the cases examined by him, the stomach was of a sienna color, and of such consistence as to be readily scraped off with the finger nail; the small and large intestines were of the same color, and presented clusters of enlarged and tumid muciparous glands or follicles. The follicles were of the size of millet seeds, and gave to the mucous membrane the appearance of having been sprinkled with fine white sand. By macerating the intestines, and suspending them in spirits of wine, so as to remove the blood and mucus, the anatomical character of the disease was clearly demonstrated to be an ulceration and tumefaction of the follicular system of the intestines. In one case, by maceration and suspension in a fluid, he discovered several common erythemoid ulcerations of the jejunum, of about two lines in diameter, which were imperceptible during the dissection.

Cruvelhier has described a disease, resembling, in symptoms, cholera infantum, under the title of “maladie gastro-intestinale des enfans, avec desorganization gelatrinaforme,” characterized by excessive thirst, frequent vomiting and purging of mucous and bilious matter, rapid emaciation, and at last an inclination to sleep, from which the patient is roused by abdominal pains, causing plaintive cries, and violent contortions of the body. Fatal collapse often ensued, in the course of twenty-four or forty-five hours. The chief morbid appearance was a gelatinous softening of the stomach, and the small and large intestines. He attributes the pathological alteration to a gastro-intestinal irritation, the special nature of which is unknown. He thus describes the alteration of structure:—
“Ce ramollissement procède toujours de l'intérieur vers l'extérieur. Il y a d'abord simple écartement des fibres, que sépare un mucus gelatineux, et par conséquent les parois de l'organe sont envahies, disparaissent enfin, de telle sorte que l'estomac ou l'intestin ramallis ressemblent à de la

* New England Journal of Medicine and Surgery, Vol. I. p. 25.

† American Journal of the Medical Sciences, No. VI.

x gelatinaforme

gélatine transparente, arrondie en tube ou en portion de tube. Si la transformation est complète, les parties désorganisées sont entraînées couche par couche, et ce qui reste paraît aminci; le péritoine seul résiste quelque temps; mais enfin, envahi lui-même, il s'use, se déchire, et la perforation a lieu. Les parties ainsi transformées sont décolorées, transparentes, d'apparence inorganique, complètement dépourvues de vaisseaux, exhalant une odeur aigrelette semblable à celle du lait caillé, sans odeur ni de putréfaction ni de gangrène. Un fait digne d'intérêt, c'est que les parties ramollies se décomposent beaucoup moins promptement que les parties non altérées dans leur organisation. L'ébullition qui convertit en gélatine l'estomac, et les intestins, donne une idée parfaite de ce genre d'altération. Je dois noter ici un phénomène bien remarquable; c'est la coloration noire des vaisseaux qui avoisinent l'altération, couleur que je n'ai jamais rencontrée ni dans les parties désorganisées, ni dans les liquides contenus."

The peculiar miasm, which produces cholera infantum, acts upon the minute ramifications of the ganglionic nerves, in the lungs, and by means of the blood throughout the vascular and capillary systems. This primary influence of the miasm on the organic nerves is succeeded by excessive secretory irritation of the follicles of the mucous membrane of the alimentary canal, which constitutes the disease. The minute and accurate researches of Dr. Horner evince that this disease extends beyond the limits prescribed to it by Dr. Jackson and Dr. Dewees, and that it prevails through the whole extent of the gastro-intestinal mucous membrane. The constitutional disturbance produced by this disease is readily explained by the extent, the relations, and the important functions of the alimentary mucous membrane. The morbid excitement prevailing through this extensive exhaling surface, causes active determination of the blood to, and profuse secretion of mucus and serum from, the exhalents and follicles. The functions of digestion, the secretion of the liver, and the processes of nutrition, are suspended. The evacuations of sero-mucoid fluid by vomiting and purging, produce rapid emaciation, drain the vascular system of the serum of the blood, suspend hæmatisis, and prostrate the vital forces of organic life.

The process of dentition, and the intense irritation of the gastro-intestinal mucous membrane, produce an irritation of the nervous apparatus of animal life. Hence arise the spasms, the pains, which in severe cases are agonizing, and the convulsions, which precede death so frequently in this disease. The contrast between the condition of the system of organic life and that of animal life, is beautifully illustrated by Dr. James Jack-

son, in his description of the protracted form of the complaint. "When asleep, the patient is impressed with the characters of death—his countenance deathly, his pulses quick and wiry, his respiration scarcely to be heard; but when he awakes, his clear eye seems to view the objects around him with a peculiar intelligence. With the utmost decision he chooses the pleasant, and rejects the offensive things, which are offered him. He seems almost to tell you, by his actions, that his stomach is faint, and sinking, and distressed; that the call for something to support it is most painfully imperious; but that the appetite can scarcely find an article which does not disgust it. The child is not disposed to make exertions; but when he does, there is often displayed a momentary energy of will, altogether disproportioned to the other appearances about him. He does not express pleasure; and at the most, only assents to what pleases him; but he frets at what disappoints him, and scolds most sharply at what offends him."

The cerebral irritation is very likely to cause congestion, inflammation, and serous effusion. Hence at last the animal powers fail—the patient sinking into a somnolent state, from which he is roused, occasionally, by excruciating pains in the bowels.

In regard to the nature of the disease, we believe it to be situated in the follicular system of the gastro-intestinal mucous membrane. The pathological appearances are various, and the evidence accumulated may not seem sufficient to enable us to separate, with exactness, the accidental from the constant lesions of structure. If this be the case, post-mortem examinations, conducted according to the accurate method of Dr. Horner,* cannot fail to establish the true pathology. The following considerations render it highly probable that this disease is seated in the follicular system. 1st. Children are liable to have the follicles of the gastro-intestinal mucous membrane highly developed, which development renders them more susceptible to disease.† 2d. This disease, towards its close, affects not only the follicles of the mouth and fauces, but of the cutaneous surface. 3d. A disease of the follicles of the gastro-intestinal mucous membrane, readily accounts for the severity of the constitutional affection, from their immense number.

Treatment.—The indications of cure in this disease, are to allay the irritability of the stomach and bowels, to determine to the surface, to

* We refer to pathological researches, by the aid of minute injections of the diseased membrane,

† Dr. Hope.

guard against local inflammation, to support the strength, and restore a healthy tone to the organism.

1st. The leading feature of this disease is an excessive irritation of the follicles of the gastro-intestinal mucous membrane. This irritation causes a determination of blood to the digestive mucous membrane, and an exhausting secretion of sero-mucoid fluid. To allay the irritation of the mucous membrane is, then, an object of the first importance. A few leeches are to be applied to the epigastrium. An enema, consisting of a solution of common salt in warm water, is to be administered, and repeated *pro re nata*; for a child, a year old, a gill of warm water to a teaspoonful of salt will be the proper proportion. The injection removes whatever fecal matter may have collected in the large intestines, and exerts, probably, through the medium of the ganglionic nerves, a salutary effect upon the hepatic secretion, and thereby allays the gastric irritability. Dr. Dewees has seen this simple remedy frequently relieve the patient, almost entirely without the aid of any other remedy. The application of leeches to the epigastrium should be succeeded by the repeated application of warm poultices over the abdomen. If leeches cannot be obtained, other measures of revulsion must be adopted. The patient may be put into a warm bath, rendered stimulating by adding salt; the surface may be rubbed, immediately on coming out, with some stimulating liniment.

R. Liquoris Ammon. ℥j.

Olei Olivæ ℥ij.

miscè benè et adde

Spt. Camphoræ ℥ij.

Olei Terebinth. ℥iij.

Saponis Duri ℥v.

miscè benè.

Olei Limonis ℥ij. M.

R. Tinct. Cantharid. ℥iij.

Olei Terebinth. ℥j.

Ammoniaë Liq. ℥iss.

Saponis Duri ℥j.

Olei Limonis ℥j.

 M. ft. Linimentum.

The warm bath and the stimulating frictions should be used daily during the continuance of the disease, and may be repeated according to the severity of the gastro-intestinal irritation. Blisters, applied over the epigastrium, are a valuable means of counter-irritation. From their occasional severe local effects in infants, they should be applied for two or three hours only at a time, and be followed by the repeated application of emollient poultices.

The vomiting is so severe, in this disease, as often to require the application of particular remedies to allay it. Dr. Dewees recommends, for this purpose, a teaspoonful of strong coffee, without sugar or milk, to

be given every fifteen minutes. Equal proportions of milk and lime water, toast water, and *small pieces of ice* (given frequently to children of sufficient age), may be tried. Hops, the green leaves of the garden-mint, or green peach tree leaves, steeped in hot water or vinegar and water, and applied warm, and nearly dry, over the stomach and breast, will be useful. These remedies, with iced and demulcent drinks, and a few doses of hydrarg. cum creta, with magnesia or soda, will in many cases effectually allay the gastro-intestinal irritation. If the severe vomiting and purging continue, and an exhausting secretion from the gastro-intestinal mucous membrane, minute doses of sub mur. hydrarg. and ipecacuanha may be administered.

R. Sub Mur. Hyd. grs. iij.
Pulv. Ipecacuanhæ grs. iij.
Sacch. Alb. grs. xij.
Ft. Pulveres xij.

One of these powders may be given every half hour or hour, till the stools evince a decided restoration of the hepatic secretion. The mode of the operation of calomel, in minute doses, is not to be illustrated by the principle of direct revulsion; for it not only changes the morbid action of the follicles, but it excites to a healthy action the hepatic and cutaneous secretions.

In addition to this plan, it is important to administer remedies calculated to give the patient rest during the night, otherwise the pain and frequent evacuations may produce a fatal exhaustion of the vital forces. To effect this purpose, it will be proper to place the patient, for eight or ten minutes, in a bath of a temperature from 90 to 95 degrees Fahrenheit; the skin should then be wiped dry, and friction employed to excite the surface. A little paregoric and wine of ipecacuanha may sometimes be given previously to the use of the warm bath. The effects of opiates should, however, be carefully watched, especially their influence on the brain. If they have an injurious influence it will be readily seen on the following morning, in the heavy appearance of the eyes and countenance, in the dryness of the tongue, and the enfeebled state of the stomach.

Another indication is to guard against the occurrence of local inflammation.

Cerebral inflammation is a frequent complication of this disease. To prevent such an occurrence, blisters may be applied to the mastoid apophyses. Dr. Eberle always applies blisters behind the ears, from the commencement of the disease. Dr. Parrish says, "in severe cases,

much good may be expected from the application of blisters behind the ears. I was led to this practice, by observing that the eruption, which, during dentition, is apt to make its appearance behind the ears, often proves a most salutary effort of Nature; and that while it continues, the infant generally enjoys an exemption from those dangerous disorders incident to this critical period of life. To imitate nature as closely as possible, the discharge from the blistered surface should be maintained for some time by stimulating dressings. I have witnessed the most beneficial effects from this practice, and can strongly recommend it to the attention of the profession." If cerebral irritation be increased by inflamed or swollen gums, they should be freely divided. If the hepatic secretion be suspended, minute doses of calomel and ipecacuanha should be given. If the intestinal irritation appear to aggravate the cerebral affection, after a few leeches have been applied to the temples, small doses of Dover's pulv. hydrarg. cum creta, and pulv. antimonialis, may be administered in mucilage of gum arabic.

Acute Enteritis sometimes supervenes in this disease. When the discharges become bloody, or consist of a muco-sanguinolent fluid, and tenesmus occurs, with other dysenteric symptoms, mucilaginous enemata, with a few drops of laudanum, may be administered. If the tongue be red, dry, and parched, and tenderness exist on pressure on the abdomen, two or three leeches should be applied along the course of the colon, and afterwards a large emollient poultice over the abdomen. Dover's pulv. and hyd. cum creta may then be given, as—

R. Pulv. Dover. iij. grs.
 Hyd. c. Cret. ℥j.
 Pulv. Gum Arab. ℥ij.
 Ft. x. Pulv.

One powder may be given every two or three hours, till the symptoms abate. Gum arabic water is to be freely given in the mean time. If the sanguineous discharges be profuse, a continuation of opium, ipecacuanha and acet. plumbi will be useful. When the disease affects more particularly the small intestines, as indicated by vomiting, thirst, a red tongue, diarrhœa, tympanitis and tenderness on pressure, leeches, or a blister to the epigastrium, to be followed by the application of a large emollient poultice, Dover's pulv. and hydrarg. cum creta, and iced demulcent drinks, will be our chief dependence. Spirits of turpentine has been recommended by different authors as a specific for tympanitis; but clinical experiments have proved this article to be injurious in tympanitis occurring in the early stage of enteritis. In such cases, the sub-

x combination

sidence of the tympanitis from the use of the turpentine is only temporary. It returns, afterwards, in a more aggravated form.

Cholera infantum frequently terminates in chronic diarrhœa. The stomach is very much enfeebled, and incapable of performing its functions. Its irritability increases with its debility, and it rejects, almost immediately, whatever nourishment may be taken. The skin is dry and withered, the patient restless and irritable. The stools vary in appearance, according to the existence of acidity, the state of the hepatic secretion, and the degree of inflammation. If the evacuations be sour, greenish, watery and frothy, alkaline and cretaceous preparations should be employed, as—

R. Creta ppt. ℥iij. or Carb. Sodæ ℥jss.

Tinct. Thebaic. gtt. xx.—xxx.

Ol. Cinnam. gt. j.

Sacch. Alb. ℥ij.

Aq. Font. ℥iij.

M. ft. Julap. (Dewees.)

s. tea-spoonful every two, three, or four hours.

Dr. Kuhn, of Philadelphia, was in the habit of giving a tea-spoonful of the following mixture every two hours, to correct acidity.

R. Magnesïæ calcin. ℥iv.

Pulv. G. Arab. ℥j.

Sacch. Alb. ℥ij.

Aq. Ment. ℥ss.

Aq. Fontanæ ℥ijss.

M. adde Aq. Ammonïæ, pur. gtt. xlviij. to clxiv. according to the age of the patient.

Preparations of rhubarb will also be useful, from their tonic effect on the stomach and bowels. A tea-spoonful of spiced or simple syrup of rhubarb, combined with a small quantity of laudanum, may be given every three hours till it checks the too frequent discharges. To correct the functional disorder of the liver, one fourth of a grain of calomel, with one half of a grain of Dover's powder, or one twentieth of a grain of opium, may be given every four hours. A few grains of prepared chalk may be added to each powder, to correct the acidity of the primæ viæ. To prevent the too sudden suppression of the discharges, the bowels must be regulated by an occasional dose of castor oil, with a few drops of laudanum.

When the tongue is dry and coated, or dry, smooth and polished,* the discharges black, pitchy, and exhausting, and the skin of a shrivelled appearance, Dr. Cartwright advises a little of the ext. of white walnut, one fifth of a grain of acet. plumbi, and a very minute portion of opium, given every three or four hours. He also uses the croton oil, for the exhausting discharges; one third of a drop, in syrup of roses, may be given to a child a year old, when the abdomen is tense, sore and swollen, and the pulsation of the carotids is quick and weak.

When we have evidence of a tendency to structural changes in the mucous membrane, the stools being slimy, watery, of a red color, and like the washings of flesh, the abdomen tender on pressure, the patient drawing up his legs when lying down, the pulse rapid, and the emaciation general, two or three leeches or a blister may be applied to the abdomen. These measures may be followed by the renewed application of large emollient poultices, and the frequent use of small doses of calomel and opium, or of hyd. cum creta, and sub carbonate of soda, with camphorated tincture of opium, in mucilage of gum arabic.

If the tongue be loaded and the stools slimy, the balsam of copaiva, in doses of five or six drops, or the spirits of turpentine in doses from five to twenty drops, with a drop or two of laudanum, may be given, with benefit, three or four times a day.

When the signs of follicular ulceration are decided, and the stools are mixed with purulent matter, small doses of the chlorate of lime, or of the chloride of soda, may be administered. The nitrate of silver, dissolved in gum arabic water, in doses of half a grain, with one or two drops of laudanum, the sulphate of iron, and the sulphate of copper, in doses of one eighth of a grain, with one twentieth of a grain of opium, are advised by Dr. Eberle, three or four times in a day.

The other indications of this disease are to support the strength, and restore the healthy tone of the organism. In the acute stage of this disease, the debility of all the important functions, especially the vital functions of the respiratory and circulating systems, is caused by an excessive irritation of the innumerable follicles of the intestinal mucous membrane. To remove this prostration, we must not apply to the irritated membrane tonics, stimulants, and astringents, but administer remedies calculated to soothe irritation, and prevent inflammatory action. By applying stimulants and counter-irritants to the skin, we shall allay the secretory irrita-

* When the discharges are acrid, dark-colored and offensive, Dr. Condie gives from five to ten grains of pulverized charcoal, four grains of rhei, and one grain of ipecac., every three or four hours.

tion, and restore the exhausted functions. If the prostration be excessive, in the early stages, frictions, with stimulating liniments, as equal parts of aq. ammoniæ and oil of amber, or fomentations with hot brandy, containing a few pods of red pepper, and the internal administration of a few drops of tincture of cinnamon or a little wine whey, may be resorted to with advantage.

The advanced stages of the complaint are more adapted to the use of tonics, stimulants, and astringents. For severe colic pains, from flatulent distention of the stomach and bowels, Dr. Eberle uses from ten to fifteen drops of the following solution, three or four times daily.

R. Ol. Juniper ʒij.
Sulph. Æther ʒss.
Tinct. Opii gtt. lx.
M. ft.

When the hepatic secretion has become healthy, astringents and tonics will be of service to restore the tone of the intestinal mucous membrane. For this purpose we may use a decoction of blackberry root, or of geranium maculatum, in milk, or of pomegranate bark and flowers; or an infusion of columbo root, or of logwood; or a combination of chalk mixture with tinct. of kino, or sulphate of quinine in syrup of roses. Dr. Chapman uses the supersaturated sulphate of iron.

R. Sal Martis gr. ij.
Acid Sulph. Dil. gtt. x.
Sacch. Alb. ʒj.
Aq. Font. ʒj.
M. ʒj. pro dosi.

Dr. Eberle has found a mixture of equal parts of lime water and infusion of Peruvian bark most beneficial in restoring the tone of the alimentary canal. He gives a dessert spoonful of this mixture, with four or five drops of tinct. of kino, in a solution of gum arabic, four or five times daily. During convalescence, the abdomen should be bound in a flannel roller.

The diet must consist almost exclusively of breast milk, in infants under the age of a twelve month, or who have been recently weaned. A healthy wet nurse should always be procured for children who have been weaned at an improper age or season. Gum arabic water may be given, occasionally, where the child is affected with excessive thirst. In

children who have been weaned, or who will not nurse, barley or rice water and milk, toast water, gum arabic water, soda water, marshmallow tea, infusion of toasted oatmeal, and liquid farinaceous preparations of arrow-root, tapioca, sago, rice and boiled flour, will constitute proper articles of nourishment. In the protracted form of the disease, beef tea, chicken tea, and animal broths, will be of service. Dr. Rush advises a more stimulating diet, as salted meats, where the child has an instinctive craving for them. A removal from the city to the country, or to the sea side, exerts a most salutary effect upon this disease. A change of air cannot be too highly appreciated as a means of cure. If the advantage of a removal from the town to the country cannot be enjoyed, the child's residence may be changed from a low and moist to a high and dry situation, and he may be daily exposed to the fresh air, either by being carried out by means of attendants, or by frequent rides into the country. When the patient has been restored by a removal to the country, he should not be returned to the city until the middle of October, or while the miasm of cholera infantum continues to prevail.

Prophylaxis.—The prophylactic measures consist in protecting the infant from the action of the specific miasm, and in guarding it against the effects of the concurrent causes of the disease.

First, the specific miasm. Dr. Caldwell has suggested, in his dissertation on malaria,* the following preventive measures.

1. The best and only certain means of protecting infants from cholera infantum, is to allow them to pass their summer in the country.
2. The next best plan of security, is to allow the patient to sleep in the country every night, during the summer months; because exposure to the miasm, at night, during the inaction of sleep, is more dangerous than exposure during the day.
3. Where these measures are not convenient, the child should pass his nights and days, when at home, in the upper stories; because the febrile miasm does not rise to the highest stories of lofty city dwellings, or, at least, does not reach them in a state of full concentration and strength.
4. A few hours exercise daily, in the open air, especially in the country, without the limits of the malaria, will contribute to maintain the vigor of the system, and to protect it from the disease. The coolness of evening, and the extreme heat of noon-time, should, however, be avoided.
5. An artificial eruption on the skin, by maintaining a centrifugal action, would probably protect the system from the

* American Journal of Medical Sciences, No. xvi., 1831, p. 330.

influence of the miasm. Children affected with prickly heat escape cholera infantum, unless from sudden change of the atmosphere, or other cause, the eruption disappears.

Beside these means, the child should be clothed in flannel, and the lower extremities kept warm by the use of worsted stockings. The frequent immersion of the child in cool water, and the use of the tepid bath, will promote cleanliness, invigorate the system, and render it less susceptible to the action of the miasm.

It is important that the child be cool and comfortable during sleep. The child's bed should consist of a mattress, or of folded blankets laid on the floor, and light covering. The air of his sleeping apartment should be rendered cool, and as pure as possible; the door of the room being kept open, and the windows, with the shutters closed, if he sleep in the upper stories.

Dr. Parrish recommends the free use of cool and fresh water, during the heat of summer; and in infants predisposed to the disease, moderate quantities of weak infusions of ginger, nutmeg and cinnamon. The tone of the stomach, in languid infants, is raised by the moderate use of spices, pepper, cloves, and the sucking of small pieces of salt meat, as ham or dried beef.

Dr. Rush advises the use of sound old wine in the summer months. "From a tea-spoonful to half a wine-glassful, according to the age of the child, may be given every day. It is remarkable that the children of persons in easy circumstances, who sip occasionally, with their parents, the remains of a glass of wine after dinner, are much less subject to this disorder than the children of poor people, who are without the benefit of that article of diet." Dr. Eberle has found the use of small portions of porter and water beneficial in feeble and relaxed infants, as a preventive to bowel complaints. Farinaceous preparations of arrow-root, sago and tapioca, and weak animal broths, form the best nourishment for children who have been weaned. The occasional use of a moderate quantity of salted meat is advised by Dr. Rush. In children who have not been weaned, healthy breast milk must constitute the chief nourishment.

Other important prophylactic remedies will now be enumerated, as necessary to guard the infant against the ill effects of *dentition*. The preventive measures are:—1st. Exercise in the open air. 2d. Daily cold sponging, followed by friction. 3d. Particular attention to produce coolness of the head; washing the head, daily, with cold water. 4th. Proper regulation of the diet. The nurse should avoid stimulants in her

food and drinks. The child should take the breast often, but not long at a time, to prevent overfeeding. 5th. Attention to the state of the gums. Painful tension should be relieved by a free incision of the gum and capsule; and if the advancing tooth be double, a crucial incision should be preferred. 6th. Gentle laxatives, when plethora exists, or where the customary salivation is not present. 7th. Blisters, or the occasional application of one or two leeches behind the ears, if there be determination of blood to the head. 8th. Avoid premature weaning, as within the year, or weaning at an improper season, as between the months of May and October.