

possess constituents similar to those of the leaves and are similarly employed, though they contain a little volatile oil and coloring matter. Olive oil in which they have been macerated has quite a high domestic reputation in many localities as an emollient.

*Hedge Hyssop* is the common name of a little perennial herb, *Gratiola officinalis* L., of Europe, which contains one or more glucosides, the very bitter crystalline one, *gratiolin*, being apparently the active agent. Its medicinal properties entitle it to a thorough investigation, since it is so active as to constitute a rather powerful emetico-cathartic poison, with marked diuretic properties. Its use, in doses of 0.2-1 gm. (gr. ii.-xv.), has been wholly unscientific, applying especially to gout and rheumatism.

*Figwort* is the dried herb of one or more species of *Scrophularia*, the genus from which the family takes its name. Like the last, the drug has not received any scientific investigation. Its bitter crystalline constituent, probably a glucoside, has been called *scrophularin*. There is also a very small amount of a volatile oil. Figwort appears to have some slight anthelmintic powers, but has been chiefly used, like mullein, in the form of a poultice. Its use is far more common in Europe than in this country.

Henry H. Rusby.

**SCURVY; SCORBUS.**—(Including Barlow's Disease.)—**DEFINITION.**—Scurvy is a systemic disease dependent upon an improper or ill-balanced dietary, characterized in its general expression by anæmia (secondary), hemorrhages into the skin and subjacent tissues, spongy or ulcerating gums, progressive debility and emaciation, resulting in death unless checked in its course by the necessary dietetic and medicinal treatment. The word scurvy is probably of Scandinavian origin, the Swedish *skörbjugg*, Danish *skøjterbug*, being equivalent to the German *Scharbock*, meaning soft or relaxed stomach.

**GENERAL CONSIDERATIONS.**—Throughout all ages scurvy has been one of the classical diseases of mankind, and although it has been successfully eliminated as one of the social and sanitary problems of civilized life, yet it would be a great mistake to infer that, by reason of our better knowledge of its causation and character, it has ceased to be a possibility in our modern surroundings. Cases continue to be reported in our most recent journals. The ancient writers abound in references to it, giving in fanciful terms their theories as to its nature and cause. In his work on "Airs, Waters, and Places," Hippocrates describes the disease in an unmistakable manner, and Pliny and Strabo give us satisfactory accounts of scurvy as it appeared among the troops in the campaigns of Cæsar Germanicus and Ælius Gallus. Indeed, it has been from time immemorial the scourge of armies, ravaging the ranks of the crusaders, the soldiers of the Middle Ages in their long sieges, the cohorts of Napoleon in Egypt, and even the troopers of the last decade of the nineteenth century, in all parts of the world where warfare is carried on under climatic or dietetic conditions new and strange to the soldier. In our own country it has invalidated half a garrison, at Council Bluffs (1820) resulting in a mortality of over thirty per cent., and later during the Mexican war our troops suffered from its appearance while in that country. During the civil war the statistics of this disease show a total of 46,910 cases in the Union army, of which 771 proved directly fatal, a small relative ratio, but it undoubtedly expended its force indirectly as a contributory factor in the termination of other cases with which it was concurrent. The same experience is recorded in the Crimean War, where 23,365 cases occurred in the French army, and 17,557 in the British army, while the numbers in the Turkish army were almost countless, as that force was practically decimated by its ravages. The Franco-Prussian war again recorded its appearance, though with a much lessened ratio of invalidism, and the Russo-Turkish War repeated the story. In the German army, as late as 1897, there were seventy-four cases of scurvy, and in the Russian and Austrian armies, the

same year, a ratio of over one per thousand strength. But in the popular conception, as well as in the professional mind, scurvy is looked upon as a disease of the sea, and of those "who go down to the sea in ships and have their business in great waters." Beginning with the first known geographical explorations of the fifteenth century, involving long voyages in unknown oceans, the records of those famous discoverers always included with their marvellous tales of "new-found lands" the story of sufferings and death among their intrepid seamen from the disease then known as scurvy. Pierre Quirino, Vasco de Gama, and Jacques Cartier all record the ravages of this disease among the crews of their vessels. As late as the eighteenth century Anson lost more than four-fifths of his men while sailing round the world. Coming down to modern times, the experience of the Marine-Hospital Service of the United States, whose function is, in part, to care for sick and disabled seamen of the merchant marine, is the most accurate index to its prevalence among American sailors, as well as a few of other flags who are treated in our marine hospitals. From the statistics compiled for a period of twenty-eight years (1872 to 1899 inclusive) the following table has been constructed to show its occurrence and frequency:

CASES OF SCURVY TREATED IN UNITED STATES MARINE HOSPITALS FROM 1872 TO 1898 INCLUSIVE.

Year.	Number of cases scurvy.	All diseases treated.	Year.	Number of cases scurvy.	All diseases treated.
1872.....	18	13,156	1888.....	17	48,203
1873.....	47	13,529	1889.....	32	49,518
1874.....	59	14,356	1890.....	28	50,671
1875.....	25	15,009	1891.....	32	52,992
1876-77.....	89	31,983	1892.....	30	53,610
1877-79.....	24	39,155	1893.....	34	53,317
1880.....	39	24,800	1894.....	27	52,803
1881.....	42	32,613	1895.....	14	52,643
1882.....	55	36,184	1896.....	24	53,804
1883.....	43	40,195	1897.....	20	54,477
1884.....	27	44,761	1898.....	6	52,709
1885.....	34	41,714	1899.....	3	55,489
1886.....	18	43,822			
1887.....	37	45,314		824	1,066,887

This is less than one per thousand cases treated for the period stated. Dividing the twenty-eight years into three periods, the following result is obtained: 1872-1880, 301 cases; 1881-1889, 305 cases; 1890-1899, 218 cases.

These figures require but little explanation beyond stating that about half of the cases of scurvy treated by the service is reported from the stations on the Pacific coast, principally San Francisco. These cases are taken from vessels coming "round the Horn" from England or elsewhere, a long voyage of several months, in which the conditions of diet, confinement, lack of exercise, etc., aid the development of the disease. While on duty at San Francisco the writer had opportunities to study and treat about seventy-five cases of scurvy in the course of three years, and it is from this experience that he has derived his practical knowledge of the disease.

**ETIOLOGY.**—Scurvy—speaking in general terms—is a disease dependent on diet and occupation. It exists either in epidemic or in endemic form whenever persons subsist for a prolonged period on a dietary which does not contain fresh vegetables, or vegetables in a properly preserved state. This condition, when aggravated by an unsanitary environment, is thereby accentuated. It is still a subject of controversy what may be the precise elements in this vegetarian problem, to the lack of which are logically due the scorbutic symptoms. Everything, however, tends to the conclusion that the disease is dependent upon the insufficient ingestion or the deprivation of the potassium salts of fruits and vegetables. These salts, in which potatoes, for example, are so rich, must have a very potent influence in maintaining the alkalinity of the blood and preventing acid intoxication. When to this lack of vegetables, with their organic and inorganic

elements, is added the enforced adhesion to a meat diet, especially if salted, or preserved by other similar processes, we have the ideal conditions under which scurvy begins and maintains its invasion. Resulting from this is a probable hyperacidity of the blood through the loss of the carbonates derived from the vegetable salts and the following loss of coagulability, with progressive anæmia. In this state of theoretical acid intoxication there is an increase in the ammonia-neutralized acid excreted as compared with the free acid. The blood is found to be dark and thin. The morphological changes are those of secondary anemias, as from hemorrhage. Various observers have noted the changes in the count of red cells in proportion to the severity of the disease, the duration, and the hemorrhages. Megalocytes and shrunken microcytes have been seen in grave cases. Red cells in solution in the plasma are reported by Albertoni. The Hb index is low, according to White, while several other investigators have made conflicting statements as to the relative ratios of iron, sodium, and potassium salts and leucocytes. Altogether, the present state of knowledge of the morphology of the blood is not enlightening, and further studies are necessary to determine the significance of the conditions which are claimed by them as pathognomonic.

A recent contribution to the discussion on this portion of the subject is that made by Albertoni, who has shown in some studies of the chemistry of the blood and of digestion that there is a serious deviation from normal in the free HCl of the gastric juice, that intestinal putrefaction is excessive and that the urine furnishes abundant evidence of the absorption of toxins, while the absorption of fats and carbohydrates is deficient. He concluded that the greenish-yellow color of the serum and the excess of pigments in the urine were proofs of active destruction of the blood cells.

As a corollary to this toxic indication may be mentioned the theory, worthy of investigation, that the disease is in reality a chronic ptomain poisoning due to putrefactive changes in badly preserved animal food, such as salt beef and canned meats. It is held that if these provisions were properly sterilized there would be no scurvy. It is not an infrequent complaint among seamen suffering from scorbutic conditions that the "salt horse" was of an offensive odor, and this observation was made among the laborers employed on the construction of a transcontinental railroad where scurvy appeared among foreigners who used this tainted meat with a plentiful supply of flour, beans, and peas.

Scurvy is not believed to be contagious or infectious. Thus far no micro-organism has been found to be of determining value in such investigations as have been made by investigators. The field has not proved to be an inviting or fertile one for bacteriologists of admitted skill. Some experiments have been made with the blood of scorbutic patients, with portions of the spongy gums and with material taken from the hemorrhagic lesions, but the results are not satisfying nor constant. It has been noted in epidemics that children suckling scorbutic mothers did not develop the disease, and in a given ship from which cases of scurvy have been taken, except in extreme conditions, only the fore-castle, where the diet was restricted to certain kinds of food, would be invaded. Isolated cases of scurvy have been found dependent upon conditions that favor either the nutritional, the toxic, or the infectious theories of the etiology of the disease advanced by various writers, but thus far the deficient vegetable dietary offers us the most practical evidence in our search for a factor that responds to all the tests of probability. Ever since Bachstrom set forth this theory in 1734—viz., the lack of fresh vegetables in the food—it has held its ground through the successive investigations of Garrod, Buzzard, and Ralfe, each carrying on by successive steps the study of this phase of the question. The last-named investigator, last in point of time as well, has formulated this theory in the following terms: The alkaline salts of vegetable acids (malic, citric, tartaric, etc.) are concerned with the normal transformation of

the carbonates of the blood; the actual factor is thus a chemical alteration in the quality of the blood, a diminution of its alkalinity; that this follows the withdrawal of salts having an alkaline reaction, such as the alkaline carbonates; that this scorbutic condition is the same as that produced experimentally by injecting acid into the blood of animals, feeding with acid salts, etc., viz., a dissolution of corpuscles, purpuric spots, and other particular signs of the disease. The morphology of the blood is disappointing in so far as it fails to afford any sure index of the condition.

While scurvy is a disease of diet and occupation, it is not a disease of country, race, sex, age, or season. It is found in all zones, among all peoples where the conditions favor it; it knows no sex, though males probably contribute a greater proportion to the statistical tables, for the evident reason that they are more usually subjected to the favoring conditions; and in the matter of age it is met with from infancy to dotage. Naturally, it prevails in those countries and among those peoples whose observances of hygienic laws are "more honored in the breach," but it is found among civilized races as well. Institutions for the aged furnish cases occasionally, but on the whole it can be said that it is a disease of adult life rather than of the extremes of age. The winter season, for obvious reasons, adds to the number of cases when the disease exists in epidemic or endemic form. As to occupation it was once thought to be a disease peculiar to the seafaring life, but it is found more on land than on the sea.

**CLINICAL HISTORY.**—A progressive upward and downward curve marks the course of a case of scurvy from its onset to its finish. It has no definite attack, no crisis. Unless the patient is under conditions known to him to be causative, as in the case of seamen on a long voyage, the approach is without warning. The preliminary symptoms are those general signs of decreasing strength, mental depression, pallor, loss of flesh, anorexia, and perhaps some gastro-intestinal disturbance. This is gradually followed by the more characteristic features of the disease. The skin becomes dry, there is "pinching" of the features, the complexion becomes of a dirty hue, for want of a more applicable term, and the gingival mucous membrane at the free margin becomes swollen and spongy. This is one of the typical features of a case of scurvy. The gums bleed upon slight pressure, appear bluish in spots, and often ulcerations follow as the scorbutic condition progresses. The gums seem to develop into this soft, necrotic texture around teeth that are broken and decayed, but it is a matter of observation that in the aged who have lost their teeth and in children before the eruption of teeth, these gingival symptoms are practically absent. In severe cases the gums swell, and rising around the teeth partially cover them with a proliferated mass of foul growth, during which time the teeth become loosened in their sockets and dislodgment may follow. The breath becomes intensely fetid as a result, the flow of saliva is increased, the salivary glands sometimes enlarge, and the tongue appears red and swollen. The eating of food is, under these conditions, not only a painful but a disagreeable function, and the sufferer seeks liquid nourishment as a relief. This condition of the gums, which usually begins near the median line at the incisors, is the first characteristic symptom, and hemorrhagic suffusions into the cutaneous, mucous, and deeper tissues is the second typical development of the disease. It is usually synchronous with or later than the gingival symptoms. These subcutaneous hemorrhages appear at first in the lower extremities, about the ankles, in the form of petechial macules, varying in size and most of them having a hair follicle in the centre. They resemble ecchymoses in some cases, in others purpura and similar cutaneous disorders. While they develop spontaneously they may be excited by blows or other injuries. The larger coalesced spots show chromatic gradations of brown, green, and yellow at the periphery similar to the "black and blue" marks following a contusion, but in scurvy there is, in the severe

hemorrhagic cases, a distinct elevation of surface upon which vesicles sometimes form. Ulcerations of an indolent type follow this and often destroy a large patch of cutaneous surface. The hemorrhages may be deeper-seated, giving to the limb affected a bosselated appearance, and when the intramuscular, the fibrous, and the subperiosteal tissues are involved the element of pain is introduced. These deeper hemorrhages constitute the one particular symptom of an advanced case of scurvy. At first they feel like doughy masses, pitting or yielding to pressure, but later the tissues lose this resiliency and, as the suffusions become more general and uniform throughout the muscular structure below the knee, the leg, when handled, feels as if it were made of wood. This scorbutic sclerosis, of which the text-books rarely make mention, may extend to the trunk and upper extremities, but it rarely invades the face or the scalp. The joints of the upper extremity, the wrist usually, may be œdematous, and this effusion may involve the serous surfaces, the pleura, pericardium, and sometimes the meninges.

Hemorrhagic suffusions into the tissues of a mucous membrane are less constant, but, in the form of epistaxes, often resulting in syncope and exhausting anæmia, they are not so uncommon. The tissues involved do not respond to the usual remedies. When the intestinal mucous membrane is the seat of scorbutic lesions, there may be bloody stools, and in advanced cases the kidneys, spleen, bladder, and other internal organs may be included in this process.

Other symptoms noted in well-marked cases are: articular swellings, with pain and local febrile movement, and ulcerations of mucous surfaces, the cornea even being involved. Disintegration of recent callus has been reported, and other similar destructive processes, too numerous to mention, have been seen in advanced stages of the disease and are cited to show how profoundly the disturbed nutrition manifests itself in constitutional effects.

While there are no marked symptoms involving the nervous system, the mental depression is noticeable and the patient seems to be indifferent to his condition and surroundings. Hemorrhages into the meninges may produce convulsions or other abnormal cerebral manifestations. Among seamen the symptoms of hemeralopia and nyctalopia are not uncommon accompaniments.

There is no constant type of temperature. In some cases it may be subnormal. The pulse is often rapid and always weak, and the heart action and respiration are affected by the slightest exertion. Hemic murmurs, common to all anæmias, can be detected. The urine is usually albuminous, of high specific gravity, decreased in quantity and of a high color. It may show the results of suffusion into bladder or kidneys. Obstinate diarrhœa, sometimes dysenteric in type, showing mucus and blood in the dejections, supervenes, and the loss of appetite and distaste for the foods that constitute the sufferer's diet, particularly at sea, soon give place to nausea and vomiting. These extreme conditions are not uncommon if dietetic relief does not intervene to turn the tide. The sufferer then presents a terrible picture, with sunken orbits surrounded by blackened circles, parted lips, and dingy yellow skin. He looks like a "breathing cadaver," as one writer has graphically expressed it.

Death from exhaustion, septicæmia, or some intercurrent infection terminates these advanced cases that have not had treatment.

**DIAGNOSIS.**—When a number of persons come from a ship after a long voyage, presenting any of the characteristic symptoms above described, or others of a similar character but less pronounced, the difficulties in the way of diagnosis are not great. Single cases seen ashore, in the early stages, might easily be classed under the general diagnosis of "anæmia" or "debility" by one not familiar with the symptoms, or not on the lookout for a disease generally believed to be peculiar to sailors. Atypical cases may sometimes confuse the diagnosis, as in all other definite morbid processes, but the differential diagnosis need only be established between it and a very few

diseases. The one which resembles it most in external appearance is purpura hæmorrhagica, but this disease has none of the special gingival manifestations, the deep hemorrhages into the substructures, nor the hard brawny feel in the lower extremities. In purpura the macules are brighter and the skin not involved is of a cleaner hue, and as a further difference the articular involvement in scurvy is much less marked than in purpura. Peliosis rheumatica (Schönlein's disease), nearly allied to purpura, may give rise to similar doubts of identity. A case recently reported by Surgeon Irwin, U. S. M. H. S., in a sailor, presented a concrete example of the confusion which may result. In peliosis the purpuric spots are distributed over the entire surface, in contradistinction to what is observed in scurvy; there is hydrarthrosis of the joints in the upper extremity with general muscular pains, and there may be œdema of the face and hands. The spongy condition of the gums does not obtain in peliosis, and the character of the eruption in scurvy differs from that of purpura hæmorrhagica. Cases from ships hailing from ports where beri-beri is endemic may require a careful differential diagnosis. In a suit for damages entered by the sailors against the ship for scurvy, the defence raised this point in answer and the writer acted as expert witness at the trial. In the œdematous form of beri-beri, where there is much emaciation, with swelling of the lower extremities, it is necessary to exercise careful scrutiny of the case with particular reference to conditions existing prior to presentation. There are no gingival symptoms in beri-beri and the œdema is different from the hard nodular feel in the legs of a scorbutic patient. It may be necessary, in cases involving litigation between seamen and vessel owners charged with furnishing improper food, and thus causing scurvy, to be able to eliminate the question of the syphilodermata and specific infection complicating the case. Such allegations are usually resorted to by defendants in these cases. It will only be necessary to mention the fact, as the differential diagnosis should be easy for the medical attendant.

**PROGNOSIS.**—The mortality from scurvy should not reach five per cent., except in epidemics, military campaigns, or in exceptional conditions on shipboard. During the civil war the rate was sixteen per cent., which considerably exceeds that obtained in our marine hospitals. In the ordinary cases met on land a favorable termination may be expected as soon as the proper measures are instituted for correcting the diet. Recovery is naturally slow and sometimes weeks and months elapse, especially in the aged and feeble, before health is fully restored. In the grave cases seen on shipboard after long voyages, or after rescues from shipwrecks, the patients may succumb to exhaustion, hemorrhages, or some intercurrent affection, but cases which seem hopeless from their general appearance quickly rally under appropriate treatment.

**PATHOLOGY.**—From what has been said of the nature of the disease it can be readily surmised that the pathology is unimportant. There are no characteristic anatomical changes, beyond the subcutaneous hemorrhages and suffusions into the deep structures and occasionally into the viscera. These have already been referred to. There may be serous effusions into the pleura or pericardium, but the peritoneum is not so affected. Parenchymatous degeneration takes place in the internal organs. The stomach and intestines present the hemorrhagic patches common to the cutaneous surface. The blood flows from these suffusions, when cut, as in a living subject. The spleen is soft and quite constantly enlarged. The condition of the buccal cavity is merely that which was previously observed at the bedside. Microscopical examination of the gingival tissues has revealed nothing worthy of special mention.

**TREATMENT.**—Scurvy is a preventable disease, and therefore the question of treatment partakes of two phases, the prophylactic and the curative. The first may be applied in the case of ships about to proceed on long "deep-sea" voyages, whalers bound for the frozen

sea, merchant ships sailing "round the Horn," or in the case of large institutions for the poor and indigent in which, for economical reasons, the diet must be restricted to the actual necessities. The United States statutes contain certain requirements respecting these matters. One relates to the supply of lime juice and vinegar (Sec. 4,569), which must be provided on voyages across the Atlantic or Pacific oceans or around Cape Horn or the Cape of Good Hope. The other (Sec. 4,612) defines what shall be the daily minimum of articles and quantities of food supplied, a not altogether satisfactory or scientific table. As each municipal institution for the care of the poor has a medical officer in attendance it will be incumbent upon him to advise the managers as to the quality and variety of food required for the proper nourishment of inmates, in order to avoid the occurrence of scorbutic symptoms among these ill-conditioned people. This can be accomplished by a judicious variation in the daily diet schedule. This diet should include not only fresh vegetables in season, but, what is equally to the point, fresh meat. In all almshouses there will be found a large proportion of persons laboring under the depressing and degrading influences of such places, persons in feeble condition or advanced life, who may confine themselves to a portion of the prescribed diet for a long period, and in whom scorbutic symptoms are inevitably set up. Osler cites a case of a woman who subsisted for many months on bread and tea, and it has been noted that in logging camps and among charcoal burners, where a diet of bread, molasses, and bacon is staple, scurvy will be found. The old maxim that "variety is the spice of life" is the keynote to the prophylaxis of scurvy when considering the dietetic question. It is not quantity nor quality, but variety that is the inviolable canon in the alimentation of mankind. Scurvy is not a disease of starvation, it is nature's revolt against lack of dietetic balance. None of the professional "fasters" ever developed the characteristic signs of the disease.

The therapeutic indication in the curative treatment of scurvy is one of dietetics rather than of medication. When the patient is first seen he should be removed from the environment responsible for the condition, whether ship, house, or room, and given such benefits as arise from change of air and surroundings. If possible, a warm bath should be given and clean clothes and a clean bed provided. These attentions are possible if the case can be removed to a hospital. The first symptom that will claim attention in an advanced case is the spongy or bleeding condition of the gums and the consequent fetor of the breath. The relief of this is a preliminary to attractive alimentation and may be accomplished by the use of any of the mild antiseptics in the form of gargles and mouth washes. It is not necessary to enumerate them. The juice of a lemon, which possesses some astringent as well as other useful properties, is a simple and effective aid in this process. More pronounced astringents, as catechu or krameria, may be employed by brushing them on the spongy mucous surfaces. Alum may be applied in the form of a powder to small ulcerative patches, and a weak solution of lunar caustic, pencilled with a camel's-hair brush, enables the operator to reach such surfaces between the teeth.

Food is to be administered cautiously at first, and the first indication is the exhibition of fresh vegetables in the form of a strained soup. The condition of the gums and teeth may not permit the process of mastication. Lemons or limes can be given in the intervals between regular meals. Spinach, boiled, is an excellent form of vegetable, possessing highly nutritious qualities and having the advantage of softness in consistency. Sauerkraut, and vegetables used as "greens," with vinegar, are also valuable variants. To this basis may be added, as a change, fresh milk, and well-cooked beef, in judiciously graduated quantities. Occasionally the vegetable diet may be distasteful, paradoxical as it would seem, but it must be enforced until the condition of the patient shows its good effects in an improved color, increased strength, and general resumption of normal conditions. That a

plan of tonic treatment is indicated need hardly be said. Iron in some form, preferably the citrate, or the tincture of the chloride, is an excellent medicament in scurvy. The use of potassium in one of its salts, to replace theoretically the loss of the vegetable potassium, as advocated by Garrod, an early authority on the disease, has not given very satisfactory results. If nausea and vomiting, due to a distaste for food previously constituting the patient's diet, be present they will soon cease after the proper alimentation is instituted; but if they continue they may be stopped by such gastric sedatives as bismuth, hydrocyanic acid, or the carbonated waters. The last named are preferable. If digestion be feeble, the bitter tonics—gentian, quassia, or strychnine—may give a necessary tone to this function. Constipation and its opposite condition, either of which may be present, are to be treated with care. The changed diet should be allowed to operate for a few days as a natural stimulus to normal action. According to my experience it may be expected to act in this way. Diarrhœa, if persistent, needs some astringent, but constipation should cause but little anxiety. Intestinal hemorrhages require more active handling, and ergot, iron, lead acetate, or any approved hæmostatic must be exhibited. Calcium chloride can be advantageously given in doses of gr. xx. t.i.d. for this condition. The stiffened joints should be treated with massage and passive motion. Gentle friction over the œchymosed regions and at points where there are signs of deeper suffusions, will prove of benefit in promoting absorption. All treatment, however, beyond the dietetic, may be classed as symptomatic.

**INFANTILE SCORBUS.**—*General Considerations.*—Within the past two decades there has been added to the list of diseases, for the special consideration of pediatricists, the scurvy of infants, following prolonged artificial feeding. To a number of English physicians, notably Dr. Barlow, who reported thirty-one cases in 1883, our knowledge is originally due, and from this physician the disease has come to be known in medical literature as "Barlow's disease," from its first reporter. Since that period it has been the subject of special study by observers in Europe and America, and scarcely an issue of journals devoted to pediatrics is wanting in some reference to the disease, its etiology, pathology, or clinical history. The American Pediatric Society considered a lengthy report on the subject in 1891 made by Dr. Northrup, and among the conclusions of the author was this: "It is a significant fact that the country which furnishes most of the literature of scorbutus in children is the same which is posted from end to end with advertisements of proprietary foods." Indeed it may be said that the appearance of this disease has a close relation, chronologically, to the development of the industry of artificial feeding of infants and the growth of the sentiment for sterilization following the diffusion of knowledge concerning bacteria.

*Etiology.*—Like scurvy in the adult, this disease of infancy is due to the continued use of an artificially prepared food which lacks some essential element required for nutrition. It is a disease found oftenest among the children of the rich and well-to-do, because in their homes are found the mothers who cannot, or will not, nurse their children, and who are able to provide themselves with prepared infant foods and the apparatus for the sterilization of milk. It may be stated as a general proposition that infantile scurvy is a disease of affluence and rachitis a disease of poverty, for though having some general resemblance to each other, these affections are distinct. As scurvy is a disease due to improper feeding, it may be further said that neither age, sex, race, nor season has any causal relation to its manifestation. It may occur at any age, but is oftenest found in infants between the eighth and twentieth months, or during the period of the eruption of the teeth and before the child is put on the enlarged diet which follows the ability to masticate. Children who are fed on the bottle later than this may also have the disease. In nearly all the cases that have been reported the patient has been fed on some one

of the following foods: Proprietary or cereal foods, condensed milk, peptonized milk, sterilized milk, any of the cereals (as barley water), or milk too much diluted with water. Of these causes it seems pretty safe to say that the sterilization processes enjoined by many physicians and adopted by the laity as a tribute to bacteria, in the preparation of these various foods, is responsible to a great extent for the conditions which follow. From observations made in cases which have developed in infants it has been found that the scorbutic symptoms will begin to manifest themselves in from six to eight weeks after the institution of the improper diet. As in scurvy of the adult the exact etiological factor is still undetermined, but it would seem that fresh milk when ingested possesses antiscorbutic properties not unlike those possessed by the vegetable elements when administered to adults.

**Clinical Symptoms.**—An infant fed on artificial food, and especially on sterilized cow's milk (brought to 212° F.), will begin to show, after six weeks or more of this diet, the general signs of systemic disturbance, pallor, restlessness, disinclination to be moved. This is followed by particular evidences of pain in the lower limbs, usually localized in the femur, and in an increasing immobilization of the legs as the disease progresses. The pains grow more intense, the knees are drawn up, held motionless, or rotated outward and fixed, simulating paralysis. It will be seen that there is a cylindrical swelling of the lower end of the diaphysis of the femur, due to hemorrhagic suffusions into the subperiosteal space, either in one or in both thighs, and as a result in advanced cases this condition is often accompanied by fractures of the bone underneath. Swelling and softening of the gums presents the typical scorbutic feature almost synchronously with the above condition, but this manifestation is not usually seen in infants in whom some of the teeth have not erupted, and this gingival symptom is usually most pronounced about the incisors or about the teeth that may have pierced through. The condition of the gums is the same as in adult scurvy, with this exception: If teeth are in the upper jaw and not in the lower, the latter will not show the spongy and bleeding and ulcerated condition surrounding teeth that are present in the former. This symptom is usually followed by another characteristic scorbutic sign—subcutaneous hemorrhagic suffusions showing purpuric spots and coalesced macules of greater or less size and the appearance of multiple tumefactions of the deeper tissues. The picture is not so different from that of the adult disease, viz., the ashen hue, the foul breath, the circles about the eyes, the swollen, tender joints, and the listless mental condition. There is no temperature characteristic of the disease unless it be subnormal. Examination of the blood affords no more satisfactory results than in adult scorbutus. Hemorrhages into the cavities of the body occur. Diarrhea is more frequent than constipation.

**Diagnosis.**—From the description above given the recognition of this disease in a developed case should not be difficult. It may be confounded in the early stages with rheumatism, rachitis, purpura, acute anterior poliomyelitis, infantile paralysis, and possibly syphilis. The first named may offer the greatest field for error. In rheumatism the joint itself is affected; while in scurvy the tissues about the joints, especially the knee, are involved. In scorbutic hemorrhages the blood escapes practically always into the diaphysis of the long bones. With proper protection of the femur the knee-joint can be moved without discomfort in scurvy. The differentiation from purpura is made in the same way as it is in scurvy of the adult type. In purpura the maculations are more evenly distributed over the entire surface, in scurvy the lower limbs are mostly affected. In infantile paralysis and poliomyelitis the immobility of the limbs is due to palsy of the muscles, while the failure of movement in scurvy is because of pain. The disease may be distinguished from rachitis by the absence of the rosary and by the typical skeletal signs of that disease. The characteristic scorbutic signs in the gums

should always enable the observer to exclude rachitis from the problem. Dietetic treatment will usually settle a diagnosis in a few days. Other diseases to be borne in mind are hæmophilia, erythema nodosum, leukæmia, and local periostitis.

**Pathology.**—The special lesions found post mortem are those relating to the hemorrhages occurring in the course of the disease, but differ in no way from those observed in the adult type. Up to the present time no characteristic signs have been found which add to our knowledge of the pathology of the disease.

**Treatment.**—Being a preventable disease it has its prophylaxis as well as its cure. The first relates to the use of proper food. If a child must be given artificial alimentation, it is necessary that it have the nearest succedaneum to human milk that can be readily procured. This to a certain extent involves the whole question of infant feeding, which cannot here be considered. This much may be said, that cow's milk is the best substitute because the cheapest and most easily procured, as well as because it contains all the necessary elements. The proportions of the constituents differ from those of human milk, but a scientific effort to "follow nature" has not been productive of happy results. Properly diluted with water and raised to a moderate degree of heat, not over 170° F., for ten or fifteen minutes, cow's milk is the most available and natural food for infancy. This heat will effectually dispose of all bacteria that need give cause for anxiety. The "pasteurization" of milk renders it truly a sterile product—a dead liquid—in which either the antiscorbutic properties are rendered inert or the low proportion of proteids favors the characteristic signs of scurvy. The effect, upon milk, of heat sufficient to sterilize it, is not entirely understood. It is a delicate complex form of protoplasm, and the effects which "pasteurization" produces upon the caseinogen, nucleins, and the calcium salts by which their combinations are disturbed, have undoubtedly to do with their efficiency as antiscorbutic agencies. This much has been learned by practical experience and points the way to the preventive treatment of the disease.

The curative treatment is upon the same order as that of the adult type—the restoration of the food that the infant has been deprived of, viz., fresh milk in properly diluted form. This milk may be given in alternation with a teaspoonful or two of orange juice every hour throughout the day. Raw beef juice, salted, may be used for a change, and barley water can afford a satisfactory alternative. But the main reliance must be upon fresh milk fed with due consideration to the condition of the infant's digestive apparatus. All other forms of treatment are symptomatic and need not be detailed. As in the adult type the most desperate cases, so far as may be judged from external signs, recover rapidly when proper food is furnished.

Charles E. Banks.

**SEASICKNESS, or NAUPATHIA** (*ναῦς*, a ship; *πάθος*, sickness. French, *Mal de mer*; German, *Seekrankheit*; Dutch, *Zeeziekte*; Spanish, *Mareo*; Italian, *Male di mare*), is the name applied to a definite syndrome group that occurs usually in persons on board a vessel at sea—but also occasionally when the subject is in a rapidly moving railway or trolley car, on the back of a camel, in a balloon, an elevator, a swing, a merry-go-round, etc.—and of which nausea and vomiting are the most marked phenomena. It is said that not more than five per cent. of human beings are entirely exempt from it; but while I have no statistics to offer, this proportion seems to me much understated. The same individual may differ in his susceptibility at different times. As a rule, those who make frequent voyages become acclimated; but some persons are always sick on board ship, even in smooth weather. As a rule, weather and the motion of the ship make considerable difference in the number of sick persons on a vessel, and in the severity of the attack in the individual. Age has some influence upon resistance. Very young children are rarely affected, and children below the age of puberty are not nearly so

susceptible as adults. Lower animals differ in their susceptibility to seasickness; dogs, horses, cows, sheep, and chickens have been affected; but hogs, ducks, and geese are said to escape, as a rule. The attack varies in both degree and duration, according to the idiosyncrasy and the physical condition of the individual. Merely uncomfortable sensations may be experienced, or the condition may be one of mental and physical collapse.

Seasickness is not in itself dangerous to life—very few deaths having been recorded—nor, on the other hand, is it beneficial, as is sometimes stated.

**SYMPTOMATOLOGY.**—Definite symptoms are presented by this affection. Abnormal increase of appetite may be the first sign, but anorexia—even active disgust for food—is more common. Headache is the rule, and is in many cases attended with a sense of fullness or congestion. It is often most intense, and usually constrictive, over the forehead or temples; sometimes the severity is greatest on the top or in the back of the head. Usually there are pain and a feeling as of pressure in the eyeballs. Often there is pain in the back of the neck. Soreness in the back and neuralgic pain in the extremities may also be present. Nausea and vomiting are, as a rule, most obstinate. Their onset may be preceded by general chilliness with pallor of the face and lips. Pylalism occurs at times, and there may be a foul taste in the mouth. Constipation ordinarily accompanies the general disturbances; diarrhoea is less frequent. Chilliness and flashes of heat are sometimes complained of. Mental depression, despondency, and even despair are frequently observed. In addition there may be complete loss of will power and of the faculty of concentration. The pulse presents a diminished resistance, being small, feeble, and easily compressed. The skin is pale, cold, clammy, and often moist. The urine is diminished in quantity.

**CAUSATION.**—Numerous theories have been advanced as to the cause of seasickness. All writers agree, however, that the complaint is aggravated by the physical and mental fatigue caused by the preparations for the voyage, by the emotional excitement of parting, by previous imprudences in diet, by constipation, and by want of proper food. The cause of naupathia is believed by some to lie in disorders of certain senses. It is given as visual disturbance caused by the constant mobility of surrounding objects; irritation of the semicircular canals caused by the frequent and varied movements of the ship, and confusion of the muscular sense, or a disturbance of the feeling of the relation of the body to surrounding objects, caused by the unstable conditions prevailing on board a vessel.

Irwin regards seasickness—or motion seasickness, as he calls it—as a disturbance of a supplementary special sense whose function is to determine the position of the head in space and to govern and direct the æstheticokinetic mechanism by which is maintained the equilibrium of the body. He holds that motion produces sickness by disturbing (a) the endolymph in the semicircular canals, (b) the viscera in the abdomen, and possibly (c) the brain and the subarachnoid at its base. The true primary cause of seasickness he believes to be irritative hyperæmia of the semicircular canals. By some the stomach has been regarded as the seat of the trouble. The view taken is that by the shaking of the contents of the stomach digestion is stopped and fermentation sets in, the undigested fermented food being thrown off by an effort of nature. According to this theory the headache, depression, and vertigo are due partly to the absorption of bile, or of some or many toxic products of metabolism or of fermentation, into the circulation, and partly to irritation of the pneumogastric nerve terminals. Some suppose that the play of the diaphragm and abdominal organs, caused by the movements of the ship, induce spasms and convulsions of the stomach. Another theory attributes the symptoms to a severe intramolecular shaking and irritation produced in the cells of particular organs by rapid movements arising from sudden change of direction of motion. The

direct mechanical effects produced on the nervous tissues by the movements of the ship are given by many as the cause of seasickness. These include repeated slight concussions of the brain produced by its being shaken up and down in its bony case; a centrifugal jarring of the brain as a result of motion along the two arcs of a circle described by the axis lines of a ship; shocks inflicted upon the brain and spinal cord by the violent flux and reflux of the cerebro-spinal fluid, induced by the movement of the vessel.

Beard believed naupathia to be a functional disturbance of the central nervous system, the cause being purely physical or mechanical—a series of mild concussions—the agitation of the nervous system by the movements of the ship. Other theories ascribe the cause to effects produced on the nervous system by disturbances of the circulatory apparatus. It has been supposed that the irregular variations of barometric pressure produced by the rising and falling of the waves cause oscillations of the column of blood within the larger vessels. Seasickness has been attributed also to sudden and recurring changes of the relations of the fluids to the solids of the body, both of which obey the law of gravity when the body is subjected to alternate movements of ascent and descent; the blood, however, descending more rapidly and ascending more slowly than the solids. Pollarin believed the condition due to the lessening of the ascending force of the blood in the aorta and in the arteries springing from it, caused by the movements of the body and resulting in anæmia of the brain. Wallaston, on the other hand, ascribed it to cerebral congestion. Chapman held that the proximate cause of seasickness consists in an undue amount of blood in the nervous centres along the back, and especially in those segments of the spinal cord related to the stomach and the muscles concerned in vomiting. Skinner believes that the motions of the ship cause movements, slight or considerable, and repeated displacements, collisions, and stretching of various organs of the body, especially of the abdominal organs, and unequal and alternate increase and lessening of pressure exerted by the column of blood on the walls of the arteries and veins. This starts a reflex nervous act, an inhibitory influence, causing a paresis of the cardio-accelerator and vaso-constrictor centres. Thus are brought about enfeeblement of the heart's action and frequently a diminution in the number of cardiac pulsations, and a consecutive loss of vascular tone with relaxation of the walls of vessels of medium calibre. This results in a general lowering of the arterial blood pressure, which is the cause of naupathia, giving rise to anæmia of the medulla, anæmia of the brain, anæmia of the skin, diminution of the blood pressure in the kidneys, and the diminution or the absence of action of the sympathetic nervous system upon the unstriated fibres of the intestine and of the arteries, and also upon the intracardiac nerve ganglia. A vicious cycle is thus established.

Gihon considers seasickness a neurosis, and says that while the onset of mild attacks may determine a temporary increase of blood in the cerebrum, it is certain that the lessened arterial tension due to the vaso-motor disturbance later deprives the nerve cells of their proper stimulus, and the consequent anæmia of these centres results in weakness of the heart and dilatation of the vessels. Even miasmatic intoxication has been made responsible for seasickness (Lemonas).

The theory that seems to me the most plausible is that which attributes to *rupture of labyrinthine compensation* the principal phenomena; thus partially allying the condition to mountain-sickness and aeronauts' sickness, in which this factor plays a subsidiary part. *Concession of nerve elements* probably adds to the sum-total of disturbances; while *auto-intoxication* is added as a result of the failure of digestion and derangement of metabolism. *Lowered vascular tone* is both a symptom and a cause of other symptoms. Psychopathy (morbid suggestion) is not to be excluded entirely, but is not in itself a sufficient explanation.