

ANÆMIA—OLIGÆMIA.

Definition.—The term *anæmia*, which signifies want of blood, consists of a deficiency of its nutritive constituents. *Oligæmia*, which signifies poverty of blood, is a more correct term; but the former is too firmly fixed by usage to permit a change. Although from the etymological point of view *anæmia* must be used to indicate a deficiency of blood, yet, by common usage, it is understood to mean poverty of the blood, and in that sense is employed in this work.

Causes.—The tendency to *anæmia* is influenced by sex, age, and peculiarities of individual constitution. The female sex is more liable than the male, for the reason probably that the former are by nature less endowed with the nutritive constituents of blood. Compared to the body-weight, and still more decidedly by sex, the blood of women contains fewer red corpuscles, more water, and less albumen and salts, than the blood of men. While the average number of red globules in the blood of healthy adult males is 141·1 per 1,000 parts, in the healthy adult female it is 127·2 (Becquerel and Rodier*). The extremes of life—youth and old age—are more liable to *anæmia* than the period of maturity. In early life the needs of the growing organism are such as to require the utmost amount of pabulum from the blood; the interchanges are more rapid, the consumption of material greater, and hence the more ready development of *anæmia* if other circumstances coincide. In old age, on the other hand, the productivity is diminished, and hence the waste may easily exceed the demand if there be any disturbance either in the preparation of materials for the blood or in the retrograde metamorphosis of the tissues. There are those also who have a natural tendency to *anæmia*, a peculiar type of constitution. They are in a condition the opposite of plethora, are deficient in the amount and quality of blood, and seem to be unable to produce it effectively. Sometimes they are persons of full habit, but possess a lax fiber, and are pale and weak.

A powerful exciting cause of *anæmia* is an insufficient supply of food. Again, the food being abundant, *anæmia* may be the result of poor digestion, and faulty and imperfect assimilation. The food abundant, and the primary assimilation active, *anæmia* may result because of a deficiency in the supply of oxygen to complete the cycle of processes terminating in healthy blood. When the products of digestion are pouring into the blood, oxygen is needed to burn off the effete, excessive, or improper materials, and to perfect the preparation of the new materials. Light is also necessary to this process. Moderate exercise, by increasing the rate of organic movements and the consumption of oxygen, favors the preparation of the blood and improves

* "Pathological Chemistry," translated by Dr. S. T. Speer. London: Churchill, 1857.

its quality. The absence or imperfect supply of food, light, air, and exercise, impairs the vital processes and induces *anæmia*. Excessive exertion and fatigue, by the over-consumption of material, directly contribute to the production of the *anæmic* state. Heat acts similarly, in that prolonged high temperature increases the rate of circulation and the interchanges of waste and repair, while at the same time it interferes with supply by lessening the appetite and the digestion. Frequent repetition of the sexual orgasm, profuse menstrual flow, prolonged lactation, hæmorrhages, are very powerful causes of *anæmia*. Diseases of the organs concerned in nutrition, notably the digestive organs, malignant growths, albuminuria, the slow absorption of various mineral, vegetable, and gaseous poisons, and numerous pathological processes, either produce or are accompanied by *anæmia*; but in this relation the position of *anæmia* is quite secondary.

Pathological Anatomy.—The changes found *post mortem* in *anæmia* from hæmorrhage are simply the appearances due to an exsanguine condition of all the organs and tissues. They are paler, drier, more compact, and free from blood. If death has been preceded by a wasting malady, not only is there the condition of bloodlessness, but the body is shrunken, the subcutaneous fat has disappeared, the muscles are thin, and the serous cavities contain more or less fluid. Patches of fatty degeneration occur in the muscular tissue of the heart—chiefly in the papillary muscles—and to the eye present the appearance of yellow spots and striae. A similar (i. e., fatty) change is to be found in the intima of the great vessels, notably the aorta. Fatty change also takes place in the gland epithelium of various organs—the kidney epithelium, the hepatic cells, the gastric-gland epithelia, etc. The blood has a brighter tint than in the normal condition, due to a diminution in the number of red-blood globules, and in the quantity of hæmoglobin. In the *anæmia* due to loss of blood, the amount remaining after death is much below the normal; under other circumstances, the diminution may be but slight. The blood is also thinner, and has less power of coagulation, the clot lacking in firmness, whence it must be concluded that the fibrino-plastic substance and the fibrinogen are below normal.

Symptoms.—The simplest and purest form of *anæmia* is that caused by sudden and considerable loss of blood, as from wounds of arteries, unavoidable and *post-partum* hæmorrhage, etc. The symptoms are eminently characteristic: the skin becomes waxy white; the sclerotic pearly and glistening, eyes sunken; the face ghastly and shrunken; the lips pallid and bluish and retracted over the teeth; the nose pointed and cold; the finger-tips white, waxy, and cold; the surface of the body is cold, and the temperature reduced below the normal; the pulse is small, very quick, exceedingly feeble, and may cease to be felt at the wrist; actual fainting may occur; consciousness restored, fainting may be repeated, and this may occur many times; the attacks of

syncope may be accompanied by epileptiform convulsions as in animals bled to death (Kussmaul and Tenner*); death may ensue in the syncope, or there may be a gradual restoration, the first change for the better consisting in a return of the pulse at the wrist, followed by warmth of the surface. But the weakness is yet extreme, and fainting occurs from the least exertion; or, when any effort is made, the face flushes, the heart beats rapidly, there is much oppression of the chest, and a sense of utter exhaustion. Excessive thirst is one of the immediate results of loss of blood, but the appetite for solid food returns very slowly. The urine is necessarily small in quantity after hæmorrhage, but the relative proportion of urea is increased. When restoration is taking place, the urea is less, the specific gravity of the urine falls below the average standard, until the normal state is reached. The most common form of anæmia is that induced by wasting discharges—prolonged lactation, for example—by disturbances in the function of nutrition—primary and secondary assimilation—by the cachexiæ—notably the malarial. This form of anæmia may be called *chronic*, while that already discussed is either acute or subacute. In chronic anæmia there exist pallor, or an earthy hue or fawn color of the skin, wasting to a greater or less extent, by disappearance of the subcutaneous fat, and a flabby state of the muscles: the skin is wrinkled, dry, and inelastic, the hair and nails appear dull and lusterless; the temperature of the surface below normal; the cutaneous circulation, the tension of the arteries, and the force of the cardiac contraction lowered; the anæmia *bruit* audible at the base of the heart and over the great venous trunks; sometimes a hæmorrhagic tendency develops; the function of digestion is wanting in energy, the appetite capricious, the bowels constipated; the urinary secretion is rather scanty, and may contain albumen, etc.; the sexual system is depressed, both male and female, and, while the sexual appetite is lessened in the male, amenorrhœa is present in the female, or there may be menorrhagia. Not all anæmic persons become paler by reason of diminished vascularity of the skin; those of dark complexion and the dark-skinned become darker. The emaciation, or at least the lessened fullness and roundness of the form due to anæmia, may be supplanted by œdema, produced by the changes in the composition of the blood. When the diminution of albumen reaches a certain point, the fluid normally contained in the tissue is not taken up by the blood-vessels, whence more or less œdema results, and, under the same circumstances, accumulation of serum takes place in the serous cavities. In this process there necessarily exist both "hypalbuminosis" and "hydræmia"—the former meaning a diminished amount of albumen; the latter, an increased amount of water. The hypalbuminosis is the most important factor in the pro-

* "On the Nature and Origin of Epileptiform Convulsions, caused by Profuse Bleeding, etc." Sydenham Society translation.

duction of the wasting or marasmus of anæmia. Not all parts lose in weight uniformly—the fatty tissue comes first, and next the spleen, liver, and voluntary muscles; and, as respects the muscular system, those waste least that are kept at work, as the heart and respiratory muscles. The weakness of the muscular system, which is so prominent a symptom in anæmia, is due largely to the diminished production of force, rather than to changes in the muscles themselves. The poor quality of the blood and the inactivity of the tissue-changes are the causes of the lessened evolution of force. A temperature below the normal is another result of the same causes. Among the most important of the symptomatic disturbances of anæmia are those of the nervous system. The organs of special sense are peculiarly alive to external impressions, and hence loud sounds, bright lights, and sharply sapid substances, make an unpleasant impression. The sensory and motor apparatus are similarly affected. Hyperæsthesia and hyperalgesia—neuralgia—are among the most disagreeable of the symptoms which occur during anæmia. Hysterical seizures, epileptoid attacks, are also results of an imperfect nutritive supply ("anæmia of the brain"). When the anæmia is extreme, as in cases of inanition, or from any cause, there is usually delirium, it may be, having a violent maniacal character, or low-muttering, or cheerful, busy delirium. The anæmia may result in syncope with temporary loss of consciousness—attacks frequently due to mere enfeeblement of the heart's action. As regards the condition of the organs of circulation, it is to be noted that the cardiac movements are feeble, the sounds muffled and indistinct, and the arterial tension low. The diminished power of the heart to move the blood leads to stasis in the venous system, which may result disastrously by œdema of the lungs, or hypostatic pneumonia, or by thromboses. More or less difficulty of breathing is a constant symptom, but there may be extreme dyspnoea when some sudden effort is made. The impaired breathing power is the product of several factors: 1. Of the increased irritability of the respiratory centers; 2. Of imperfect depuration of carbonic acid, and insufficient supply of oxygen.

Course, Duration, and Termination.—The course of anæmia is that of the malady with which it is associated or on which it is dependent. If due to hæmorrhage, or some sudden accident, it is acute, but the usual course is chronic. It has no defined duration, and is in no sense a self-limited disease. The progress of recovery is influenced by age, sex, and the recuperative powers of individuals. While women bear loss of blood better than men, they possess less restorative energy. The hygienic circumstances and the social condition are important elements in the process of reconstruction—for those who are most favorably placed have the best chance of recovery and the least delay in convalescence. Anæmia may result in death, in recovery, or in incomplete recovery. When the anæmia has been extreme, and the

destruction of red-blood globules great, recovery is rarely, if ever, complete, and the patient's bodily vigor remains more or less below the normal.

Prognosis.—The cause of the malady and its associated states enter largely into the question of prognosis. When the anæmia is simple, due, for example, to sudden loss of blood, or to prolonged lactation, or to malarial infection, or to sexual disorders, or to diseases of digestion—all of which are perfectly remediable—the prognosis is favorable. When, however, anæmia has been produced by excessive loss of blood, and a condition of extreme debility has persisted for weeks; when associated with great mobility of the nervous system, and with protracted amenorrhœa, the prognosis must be guarded in respect to complete recovery. When anæmia is associated with cancer, albuminuria, suppuration of bone, amyloid degeneration, phthisis, scrofula, etc., the prognosis is unfavorable.

Treatment.—As the condition to be remedied consists in an impoverished state of the blood, obviously treatment must be directed to the organs concerned in the elaboration of blood; the organs of digestion, including the liver and pancreas, and the organs for the production of the corpuscular elements—the spleen and lymphatic system. The first step consists in the rectification of any existing disease of the digestive apparatus, if remediable; the second, in the supply of suitable aliment; the third, in the administration of certain medicines needed in the construction of the blood; and, fourth, in the admission of air, sunlight, and suitable exercise to an important place in the treatment, for these are required to perfect the final stage of the conversion of aliment into blood. If the digestion is feeble by reason of a deficiency of gastric juice, muriatic acid and pepsin should be administered after meals. If there be torpor merely, this may be overcome by the use of nux-vomica tincture, or the simple or aromatic bitters—these acting as local stimulants to the stomach-glands. If the appetite is languid and the stomach is equal to the digestion of the aliment taken, it will suffice to depend on the third group of remedies. A suitable supply of properly proportioned food is of the very highest importance. The albuminous or nitrogenous constituents—fresh animal food, eggs, milk, etc.—are the most necessary, but vegetables and fruits are also useful. If the digestive organs support food badly, it should be given in small quantity at short intervals, and, if solid food can not be managed by the stomach, beef-juice and milk can be given instead. The blood plasma may also be supplied directly by the rectal injection of defibrinated blood on the plan of Dr. Smith, of New York, which is a most important addition to our resources in the treatment of anæmia. A moderate quantity of alcoholic food is also highly serviceable—say, a tablespoonful of whisky three times a day—but it should always be remembered that a taste for alcoholic beverages is

quickly formed under these circumstances. The medicines required are those actually used in reconstruction of the blood, viz., iron, manganese, and the phosphates. As iron and manganese exist together in the blood (1 to 40), and also throughout nature, it is very useful to follow this indication and administer them together. There is another view of the utility of iron—promulgated chiefly by Brown-Séquard—that it acts solely by increasing digestion, and that the food taken in increased quantity under its use contains sufficient iron to supply the requirements of the blood; but the former view is that chiefly entertained. The saccharated carbonate of iron and manganese is an excellent preparation, or the dried sulphates of iron and manganese may be prescribed in pill-form, with or without extracts of nux vomica, gentian, or calumba. The question of the comparative utility of the vegetable or mineral-acid compounds of iron frequently arises. Notwithstanding the paradoxical character of the statement, it is generally true that the more irritating and astringent preparations are better borne, and they are certainly more effective. Next to iron and manganese are the phosphates, especially the phosphate of lime. In the anæmia of lactation there is a very marked deficiency in the quantity of phosphate of lime, and in all forms more or less reduction of the proper amount of this substance. The sirup of the lacto-phosphate is the best form for the administration of this agent, if well and genuinely prepared. Pyrophosphate of iron may be given with the phosphates, as compound sirup of the phosphates; or the elixir of the phosphate of iron, quinine, and strychnine may be prescribed under the same indications.

When purpura, or the hæmorrhagic diathesis, or allied states of the blood exist, great advantage is derived from the conjoint administration of ergot or digitalis with quinine; for iron is not well borne when the hæmorrhagic tendency exists, although the blood may be deficient in this constituent. Among the remedies for promoting the nutrition of the body, cod-liver oil takes a high place. It is usefully administered with the phosphates, especially in those cases in which anæmia is associated with impaired nutrition of the nervous system, and lowering of the general nutrition in cases of pulmonary disease. In the anæmia produced by phosphorus, carbonic-acid narcosis, coal-gas poisoning, etc., transfusion has been successfully employed. Uninjured new elements introduced into the veins, the condition of anæmia is at once removed. The operation of immediate transfusion of human blood is alone justifiable under these circumstances, for lamb's blood will not functionate properly. When the food is undergoing final conversion into blood, the oxygen of the air is necessary to complete the changes. Hence some exercise, short of fatigue, should be taken about three hours after the meals, for at this time the products of digestion are pouring into the blood, and then the oxygen is espe-

cially, needed. Moderate exercise effects a proper distribution of the blood in the body, increases the absorption of oxygen, and the excretion of carbonic acid and urea. In proper limits exercise promotes the metamorphosis of tissue, and is therefore serviceable in anæmia, but, carried to fatigue, waste is greater than repair. The method of combined rest, massage, faradization, and forced feeding, practiced by Weir Mitchell,* is extremely useful in these cases, and will often succeed when other means fail.

CHLOROSIS.

Definition.—Chlorosis and anæmia are usually regarded as identical disorders, but they differ sufficiently to be treated separately. The peculiarities of chlorosis are simply referred to the sexual condition, and it is therefore, according to this view, an anæmia occurring in girls about the period of puberty. The term *chlorosis* relates to the peculiar tint the complexion assumes in this disease, and in common language it is designated “green-sickness.”

Etiology.—Chlorosis is a disorder of the female sex almost exclusively, and those cases occurring in males are examples of modified anæmia. Puberty, or the period of sexual evolution, is the time of life when this disorder develops—from the fifteenth to the twentieth year. An inherited disposition seems to exist in many cases, for nothing is more common than the references of the mother to her own experience when the daughter betrays the first signs of the malady. The type of constitution which is thus transmitted is distinctly of lowered vitality—“the gelatinous descendants of albuminous parents” is the apt phrase descriptive of the constitutional state. These subjects are light, fair, full, round, but white, having blue eyes, soft tissues, and feeble muscles. Menstrual irregularities seem closely associated with chlorosis, either as cause or effect. According to Virchow, abnormal narrowness of the aorta is an important factor. If an hereditary predisposition exist, or congenital defects in the vascular system, the ordinary contingencies of social life may suffice to develop it—especially the cultivation of the emotional life—but it occurs quite independently of erotic sentimentality. On the other hand, this condition of the system comes on without any apparent cause, or spontaneously. Hammond, who has made an elaborate study of chlorosis (“Journal of Psychological Medicine”), maintains that it is an affection of the nervous system, the blood-changes being secondary.

Pathological Anatomy.—The body is fairly well nourished, and the subcutaneous fat pretty well distributed. The organs are generally pale. The serous cavities contain but little fluid, and there is no œdema

* “Fat and Blood, and how to make them.”

of the inferior extremities. The most important change occurs in the blood, and consists in a diminution of the red corpuscles. This can now be readily determined by actual count, using the hæmacytometer, as modified by Gowers, for this purpose. As the iron of the blood is reduced in this disease, it is probable that the diminished staining power, which is so conspicuous an alteration, is due as well to diminution of the hæmatin as to loss of corpuscles. In chlorosis the albuminates and the leucocytes are not diminished, unless an anæmia develops in the course of the former, when the alterations peculiar to the latter are superadded. Neither is the volume of the blood apparently reduced. We owe to Virchow the important fact that in recurrent and persistent chlorosis, abnormalities exist in the vascular system: the aorta and arterial system, generally, are smaller in caliber, and thinner, the intima having a “trellis-like” arrangement; and the tunics of the vessels are affected by fatty degeneration in spots, and striæ of a yellowish color, especially the intima. These spots are found in greatest numbers about the origin of the ascending aorta, and on close examination are found to be a collection of minuter spots, each corresponding to a connective-tissue corpuscle, which is advanced in fatty degeneration. The heart may be normal, may be abnormally small, may be somewhat hypertrophied, but the alterations of this organ are not constant. The spleen, the lymphatics, and the marrow of bones, are not affected in any way.

Symptoms.—Girls about the period of puberty are the subjects of chlorosis. With or without disorders of menstruation, the affected person experiences a change in her feelings, and becomes morose and despondent, or capriciously vibrates from an extreme of high spirits to corresponding depression, but low spirits is the habitual state of the largest number. There is no reason to believe that erotic feelings are mixed up with the gloomy fancies which dominate the mind, but nymphomania is in rare instances present as a symptom. Hysterical manifestations may also occur, but do not constitute a necessary part of the malady. As respects the actual condition of the sexual organs, there are two forms of derangement which happen in chlorosis: there are the amenorrhœic form and the menorrhagic form—cases in which the menstrual flow is absent; cases in which the flow is excessive. After an attack of menorrhagia, or after the failure of the flow to appear, the changes in the mental state above mentioned manifest themselves. Then the complexion changes. Fair-haired and white-skinned girls (blondes) become pallid, and waxy, and puffy, but without œdema; dark-haired and dark-skinned girls (brunettes) assume a muddy, grayish coloration, with bluish-black rings under the eyes; the sclerotic being pearly and glistening, and the mucous membrane of the mouth pallid. There is present, constantly, a strong feeling of fatigue, and the least exertion causes weariness, while strong mus-

cular effort induces exhaustion. Muscular effort of any kind starts the heart into tumultuous action, and brings on difficult breathing and a sense of oppression. The anæmic *bruit* heard at the base, and over the great vessels, exists in chlorosis as in anæmia. The pulse is rather full, but soft, the action of the heart irregular, the breathing not rhythmical, and a dry, barking, or noisy cough is not unfrequently present. The appetite is usually capricious—now satisfied with difficulty, now indifferent to food, but characterized by sudden desire for unusual articles, or by craving for pickles, slate-pencils, chalk, etc. Attacks of cardialgia are frequent and severe, and may indicate the presence of a gastric ulcer—a not infrequent complication of chlorosis.

Course, Duration, and Termination.—The course of chlorosis is affected by the social circumstances, and the treatment still more, by the presence of the changes described in the vascular system. There are several important complications which affect the behavior of chlorosis. The first is anæmia, the development of which increases the gravity and adds to the duration. Phthisis develops in a considerable proportion of the cases, and in part doubtless because of the narrowing of the aorta. Perforating ulcer of the stomach is an occasional and very fatal complication. The explanation of its relation to chlorosis is, probably, the existence of fatty change in the intima of a stomach-vessel, thrombosis, and rapid solution of the mucous membrane. Chlorotic subjects—those affected with the changes in the tunics of the arteries, certainly—are very liable to attacks of endocarditis. Virchow, to whom we owe our knowledge on the subject, has further pointed out that during pregnancy, and in the parturient state, they are apt to suffer from ulcerative endocarditis of a most malignant character.

Paroxysms of hysteria and attacks of chorea are not infrequent, especially the former. Chlorosis is also a large and important element in the formation of exophthalmic goitre, but the cases are too rare to give this fact importance here. The duration of chlorosis is very uncertain. It is not a self-limited disease, and manifests no tendency to spontaneous cure. It may terminate in recovery, in partial recovery, or in some intercurrent malady, as pneumonia, typhoid fever, endocarditis, perforating ulcer of the stomach, cerebral hæmorrhage, etc. The prognosis is favorable for simple, uncomplicated cases, but must be guarded for cases which recur, as they may be examples of chlorosis with vascular changes.

Treatment.—As lessened hæmatin and hæmoglobin is the essential element in chlorosis, the administration of iron is the main point in the therapy. The combinations of iron with a mineral acid (tincture of the chloride, sulphate, etc.) are usually more effective than the so-called mild preparations. The addition of manganese is useful, because of the intimate association of these minerals in the blood-glob-

ules. The utility of iron does not consist solely in supplying to the organism of the chlorotic a material which is deficient, but in stimulating the appetite and the digestion, so that more food is taken and disposed of more easily. It follows that iron must be given in large doses in this disease, and experience is in harmony with theory on this point. Excellent results are obtained from the conjoined or simultaneous administration of iron and the phosphates—notably from the pyrophosphate of iron and lactophosphate of lime. Again, many cases do better—the majority, within my observation—by the combination of iron with some agent having the power to exalt the cerebro-spinal functions, as arsenic and strychnia. An excellent prescription, notwithstanding the chemical incompatibility, is the pil. ferri carb. with arsenious acid or arseniate of iron; or, Fowler's solution may be given separately, after the chalybeate. Strychnia, iron, and manganese sulphates can be given in pill-form. Hammond, influenced by his theory of the nervous origin of chlorosis, holds that arsenic is the true remedy, and his experience supports his theory. The author has seen the best results from a combination of iron and arsenic, and this fact he urges upon the attention of his readers. A generous diet, out-door air, and moderate exercise, are essential elements in the therapy of chlorosis. The combined treatment of rest, forced feeding, massage, and faradization, advocated by Weir Mitchell in these cases, seems to succeed in many wonderfully. The measures above recommended, combined with suitable hygiene, rarely fail, however, to effect a prompt cure. No treatment will accomplish more than a temporary cure in those cases associated with changes or abnormalities in the vascular system; for the chlorosis will recur from time to time, and possibly the case terminate at last with ulcerative endocarditis in the pregnant or parturient state.

PROGRESSIVE PERNICIOUS ANÆMIA—ESSENTIAL ANÆMIA—MALIGNANT ANÆMIA.

Definition.—By the term *progressive pernicious anæmia* is meant a form of anæmia of most severe character, progressive and fatal, and accompanied, toward the termination, by a fever.

Causes.—This disease occurs usually in women from fifteen to forty years, who have been repeatedly pregnant or subjected to debilitating influences, as uterine hæmorrhage, or to bad hygiene. It is not known why, in some cases, these etiologic factors will cause anæmia, and, in a few rare individuals, excite the far more formidable, indeed malignant, ailment.

Pathological Anatomy.—There is little or no emaciation due to the disease. There may be a good deal of fat under the skin, and the body may present an appearance of fullness and roundness, due to a