

said to indicate the effects of this kind of tissue displacement and disintegration.

For some time physiologists refused to believe in the production of fat from starch, but it was decisively proved by fat found in the larvae of the gadfly, born and fed in the cavity of the gallnut, where the only food was starch.

The ultimate chemical composition of starch and fat is nearly allied, and both are easily interchangeable in the animal economy. Fat can be produced from starch and sugar in the human body. Beeswax is a true fat formed from honey. Animals fed abundantly on grain, and suffering from deficiency of oxygen, become rapidly loaded with fat. Geese, prevented from moving and crammed with maize or wheat, have enlarged livers so charged with fat as to become unfit for proper functions. Stalled cattle are much fatter than those that travel far in search of food, and wild animals are lean. Starch in the human body is changed into sugar, becomes soluble and is absorbed into the portal circulation, enters the liver, and thence, by fermentation or otherwise, is changed to fat. The hydrogen gas given off is oxidized into water in the body. Fatty acids being derived from sugar by fermentation, and sugar being formed from starch in digestion, a diet containing starch in excess, with a minimum of mineral ingredients, will tend to produce diseases depending on the tissues being unregulated, unbalanced and replaced by fat and fat-acids, particularly when the catarrhs are easy and sedentary life.

Flour causes decayed teeth. The prevalence of decayed teeth among flour-eating people is humiliating to modern civilization. It exists to an alarming extent among children, hardly one of whom, over five years of age, when subjected to examination is found with perfectly healthy teeth. Savage races are noted for the perfection of their teeth. Dentists seemed to hold that destruction of enamel involved the loss of the tooth. Physiologists attributed the preservation of negroes' teeth to their abstinence from hot drinks. The Krumas hack their teeth with knives or rough iron, and the sharpening, instead of producing caries, acts as a preservative by facilitating the laryngeal process. The East African will devour his agah when the temperature would scald the hand. Both races have pearly teeth, except where lime and tobacco is chewed. Among the North American Indians a decayed tooth is rarely seen. Their diet is chiefly animal food. Civilized races, with all the advantages of a regular supply of food, comfortable abodes, and the stimulus of high mental culture, are less favored than the savages in this important respect. Their staple food lacks the mineral elements needful to make teeth. Flour has little lime and phosphorus. Curial anything three-fourths and you have the ratio of with drawal in the above instances. Teeth are known to improve on proper diet.

Flour may be a cause of the present general prevalence of premature grey hair and baldness, owing to the want of sulphur, an essential ingredient of hair, and natural baldness being uncommon among savages, and non-flour eating people. The bristles from pigs fed on flour products are valueless to brush makers. Cattle, in the season of shedding their hair, require more salt than ordinary, and those fed on sufficient salt have had some hair and glossy skin, showing the evident influence of a mineral ingredient. In flour there is a large withdrawal of the basic element of salt, and hair fed on food so deficient in formative force and mineral ingredients as flour, must suffer serious loss of vitality.

Flour may be a cause of the prevalence of weak eyes. What may promote decay or weakness of the teeth, may do the same for the eyes. A saturated solution of sugar in water injected under the skin of a frog or guinea pig will soon produce cataract in both eyes. Cataract is a degeneration of the fibres of the crystalline lens. My own researches show that it is sometimes fatty. Sugar is not so innocent a substance as ordinarily imagined. Starch becomes sugar before it gets into the circulation, and must strongly influence the physical condition of the ocular tissues.

The Formation of Fog.

Dew is a condensation of invisible moisture from the air, which becomes visible when condensed, and its condensation is owing to a difference of temperature between the air which parts with the moisture and the object on which the moisture, as dew, is deposited. On the other hand, a mist or fog is simply a cloud floating lower than usual; in other words, it is a body of vapor rendered visible by contact with an atmosphere colder than that by which it was raised from the earth or the sea in the form of invisible vapor. The fine invisible particles of water suspended in the air are rendered visible when the temperature of the air is suddenly lowered, the direct effect of cold being to cause condensation and aggregation of the particles—in other words, the vapor is thrown into a gross form by cold, and in a certain sense is preparing itself to fall in the form of rain, and fall it must when the condensation reaches a certain point, and the air can no longer sustain the globules as part of itself. It can be understood, of course, how a mist be a rain and yet no rain be felt. It may be often observed that the spiders' webs and

other such light bodies are loaded with moisture after a mist has prevailed for some time, but that moisture is not dew, it is, in the strictest sense of the word, rain, but falling so slightly that it cannot be felt, nor the act of falling seen. At times, however, it happens that the moisture can be felt, not as condensing in the form of dew, but falling in the form of the finest rain, so fine that at first we hesitate to call it rain, but perhaps increasing so as at last to bear not only the name but the appearance of rain, the result of the cloud or fog becoming so far condensed as to be unable any longer to float in the atmosphere.

It will be observed that the moisture held in solution by the atmosphere is invisible so long as the solution is perfect, and then we have a clear blue sky with sunshine or moonshine, as the case may be, and usually a considerable deposition of dew. But a lowering of the temperature of the air diminishes its power of holding water in solution, and the excess over and above its now limited capacity is rendered visible in the shape of mist or fog or cloud. The important point for the observer, therefore, is to note that dew is condensed on an object exposed to the atmosphere in connection with radiation of heat by that object, while fog is the result of condensation within the body or bulk of the air itself. The influence of heat is the key to every phase of these several phenomena. In hot weather the air is loaded with a larger proportion of moisture than in cold weather, and in hot countries the amount of atmospheric humidity is usually greater than in cold countries. The higher the temperature of the air, the greater is its capacity to carry moisture in perfect solution and invisible—unless, indeed, we regard the lovely azure color of the cloudless sky as the natural color of the moisture suspended in it; for there cannot be a question that if the atmosphere were absolutely dry, the sky would be black as ink, and diffused daylight a boon unknown. There are times when the moisture held in solution by the air not only deepens the blue of the sky, but, as may happen soon after sunrise, when as yet the sun has lifted but little vapor, and that is rendered invisible by complete absorption or solution, the diaphanous condition of the atmosphere is so perfect that distant objects are defined with unwonted clearness and the landscape presents an exalted tone, its beauty being strangely enhanced, and many objects acquiring a tone of unreality.

That mists and fogs should be more prevalent in marshes and along the courses of rivers than in upland districts will be understood from the explanations thus far offered. But as changes of temperature tend to precipitation of moisture, the mist of the mountain admits of the same explanation as the mist of the valley, although the minor circumstances of its production may be different. So again that very curious phenomenon, a London fog, however it may present problems that demand all the powers of the chemist and mathematician, and, indeed, of the astronomer and geologist, for a complete explanation, cannot, in a collective sense, be regarded as a mystery at all. Here is a great city warmed by fires and holding in its mass much stored up heat imparted to it by the summer sunshine. From this aggregation of edifices and animal life a warm mist is ever rising, and in fair weather with high barometer and with breeze enough to prevent stagnation, the vapors, the smokes, and other exhalations are quickly absorbed or dissolved into the general body of the air, and rendered invisible; so that, as seen from Cheapside, the summer sky is scarcely less blue than as seen from a green hill-side miles away in the heart of the country. But an immense city like London taxes the absorbing power of the atmosphere to the very utmost, and the slightest change of wind or temperature, or density unfavorable to the absorbing or dissolving process is followed by the formation of visible vapor, and then, as seen from Cheapside, the blue sky becomes a grey sky, and then a brown sky, and ultimately there ceases to be a sky, and the diffused daylight diminishes. If a very cold wave passes over, and with such slowness that the state of the air is that known as dead calm, the rising vapors are condensed so rapidly and are kept so closely over the place of their origin as to constitute a London fog, which is the worst of all fogs the world produces, being so largely contaminated with particles of carbon, the smoke being mingled with it, and treated by the cold stratum of air above in the same way as it treats the rising particles of pure water. It must be remembered, too, that smoke is not dry carbon, but real vapor, the proportion of water in smoke being very large; and therefore the smoke is not to be regarded as an element superadded, for it is a part of the general humidity which the cold condenses, and not only renders visible to the eyes as an "atmosphere of pea-soup," but manifest to all the senses, so that we both smell and taste a London fog, provided it does not utterly choke us.

That fogs should prevail especially in November is no more a mystery than the conditions that produce them. The first frosty weather finds the earth warm and exhal-

ing moisture freely. Hence the first cold wave encounters a large bulk of warm vapor, and, having a large body of material to act upon, produces a more striking effect. But as the winter progresses the earth cools down, and the temperature of the surface approximates to that of the air, and while the exhalations are thereby diminished, the difference of temperature between the exhalations and the upper stratum of the air is less, and the mists produced are less dense, though more widely diffused. When the sun is seen like a red-bullet grimly gleaming through the fog, it is a sign that at an altitude of a mile or less there is a clear blue sky and brilliant sunshine, which may be enjoyed in the course of a few minutes by the simple process of making an ascent in a balloon.

Charbon or Anthrax Fever.

Great alarm has been caused in Ireland by the appearance among stock of a malignant disease which has been called Charbon. The veterinary correspondent of the *Chicago Tribune* says that the disease is either Anthrax Fever or Anthrax Carbuncle, and belongs to, or is one of the forms of, the large and exceedingly dangerous group or family of diseases known as Anthrax-diseases, the same of which Black Leg, Milk Sickness, and so called Hog Cholera are the frequent and well known representatives in the Mississippi Valley. The disease called Charbon has been well known, though by various names, as an Anthrax form, not only in modern times, but also by the ancients, and has made its destructive appearance repeatedly in all ages, and in almost every part of the globe, in the tropics, in the temperate zone, and even in the frigid region,—sometimes as an epizootic, sweeping a whole country or a district; sometimes as an enzootic, attacking almost any animal, or a whole class of animals, in a certain locality; and very often as a sporadic disease, picking its victims here and there. Hence the disease cannot lay claim to the predicate "singular," as that would indicate that the same is new, peculiar, strange, or comparatively unknown, which is by no means the case. Probably the oldest record of the occurrence of Anthrax-disease, and very likely of the same form which is called Charbon, is given in the books of Moses (*Exodus and Leviticus*); and shows that not only the destructive character, but also the contagiousness, of that disease must have been known when the Israelites left Egypt. Homer, too, must have known Anthrax (*Iliad*, I., 50-52). So Ovidius (*Metamorphos.*, VII., 536-585) describes an Anthrax-plague which prevailed as early as about a century after the Trojan War. Other proofs that Anthrax-diseases were well known and made their frequent appearance in ancient times, are furnished by Plutarch, Dionysius, Livy, Lucetius, Thucydides, Virgil, Columella, and others. Dionysius especially (*Antiq. Rom.*, lib. VII., page 472) describes the disease as attacking first the pasturing live-stock, then the animals kept in the stables, afterwards the herders and the farmers, and finally other people. He gives also an account of the immediate causes, which are exactly the same that produce Anthrax diseases at the present time.

That later writers have left us abundant information in regard to Anthrax epizootics and enzootics, does probably not need any further proof; and that modern veterinarians and pathologists have not failed in paying sufficient attention to such a destructive and fatal group of diseases,—Prof. C. F. Heusinger published in 1850 a monograph on Anthrax diseases of animals and men, which contains over 800 pages. It is also evident enough, and will probably be taken for granted without giving a long list of names and dates.

It cannot be said that either Charbon or any other form of Anthrax baffles the skill of the veterinary surgeons. Of course a disease in which the morbid process commences with a wholesale destruction of tissue, and which causes death not seldom within a few minutes, is fully developed, *ex ipso* incurable; just the same as it is impossible to restore a rotten apple or a foul egg to soundness again. Concerning such a disease, it is, therefore, much less the task of veterinary science to find a remedy or a cure than it is to investigate the nature of the morbid process, and to discover the causes which are able to produce the same; for, that accomplished, an effective prevention, of much more value than all efforts to effect a cure, is in most cases not so very difficult. If physiological laws are not violated, Anthrax, and other similar diseases of man and beast, are an impossibility. Regular and uniform feeding of nothing but what is sound and healthy, fresh and pure water of medium temperature for drinking, pure air for breathing, protection against the extremes of the weather, and avoiding any exposure to the contagion, will surely prevent any Anthrax disease, no matter whatever its name may be, whether it is Charbon, Black-Leg, Wild-Fire, Gangrenous Erysipelas, Hog-Cholera, Milk Sickness, or Malignant or Gangrenous Typhus.

The fact that physiological laws have been better complied with in modern times than in the dark middle ages or in ancient times, and that live-stock, as a general rule, is kept in a more rational way now than in olden times, has accomplished this much: that all forms of Anthrax have lost a great deal of their old violence. The contagion, too, if otherwise reliable authors can be trusted, has lost considerable of its former intensity.