

ends vary infinitely, so should the means also vary, and the whole dispute between the vegetarians and non-vegetarians is terminated by the old proverb—"One man's meat is another man's poison."

Having thus briefly described the inorganic and nitrogenous ingredients of food out of which the bony skeleton with its ligaments, and the muscular fibres of the body are procured, let us proceed to investigate the character of the materials which furnish the non-nitrogenous remainder of the animal frame, and the complex series of transmutations which they undergo before their final adjustment to the parts they play in the living organism.

The starch group is the first we here encounter, and the most important. It consists of—

1st. *Starch or fecula*. A substance found generally in those parts of a plant to which light does not penetrate. It exists in the greatest abundance in the potato, and forms above sixty per cent. of most grains. Its formula is  $C^{12} H^{10} O^{10}$ . It is soluble in warm water, and readily transformed into a substance called dextrine, of similar atomic constitution, but of different physical and chemical properties, by the contact of saliva and various organic substances.

2nd. *Cellulose*. Of the same atomic constitution as starch, and like it, by long exposure to the action of acids, being converted into dextrine, but insoluble in water. It abounds in green vegetables, especially cabbage.

3rd. *Pectin*. Of the same atomic constitution as the former two. It is imperfectly soluble in water, but if exposed to the action of acids at a higher temperature, it passes into a substance called *metapectic acid*, which is soluble. Pectin is met with in large quantities in various roots, such as carrot, turnip, &c. and still more in the fleshy fruits, such as raspberries and apples. The gelatinous-looking substance so abundant in the Carrhageen moss, is nothing more than a modification of pectine.

4th. *Dextrine*, or gum. These are essentially alike, but the term gum has a more limited application. *Dextrine*

may be called the father of all the gums. It exists in large measure in all ripe fruits, and is the transition form of the metamorphosis of all feculent bodies into sugar. It derives its name from its action on light; the polarized ray is thrown by it to the right; probably the ray thrown to the left, acting upon similar elements, forms true gum.

5th. *Grape sugar and glucose* are closely allied, and only distinguishable by the difference of their action on the polarized light, and the crystallizable character of grape sugar, which glucose cannot attain. Besides being readily produced by the action of various substances upon other forms of fecula, it exists naturally in figs, apricots, and many other sweet fruits, as well as the grape. It is readily soluble in water, and if any nitrogenous body be present it undergoes fermentation as it is called, and is converted into alcohol. It is also changed by the action of caseine and of bile, according to Van den Brock, into sugar of milk and butyric acid. Sugar of milk has the same composition as grape sugar, but cannot pass spontaneously into alcohol; it requires first to be changed into grape sugar, a transformation readily effected by the action of an acid.

Cane sugar differs atomically from all the other sugars, its formula being  $C^{12} H^{11} O^{11}$ ; or, as there is probably one atom of water in this, the truer formula will be  $C^{12} H^{10} O^{10}$ . Like sugar of milk, it is incapable of direct fermentation, and to acquire the useful property it has to become grape sugar, through the action of an acid.

Thus we see that all the varieties of starch may be promoted into grape sugar, that highest point of advancement of the class, at which it undergoes the astonishing transformation from a sweet and harmless material for the nourishment of the body, into a fiery stimulant called alcohol, the most fertile source of every human crime, the great author of madness and suicides.

The second non-nitrogenous group consists of substances from which fat is derived; for although grape sugar may