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About Static Electricity

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erable degree of acidosis. The alkali reserve of the blood is diminished, partly at least as the result of a tendency for the bicarbonates to be excreted in the urine in larger than normal quantities. This action is often accompanied by a tendency to retain urea. Due to this loss of bicarbonates and accumulation of acids, the blood shows a lessened power of combining with carbon dioxide. There is also a decreased oxygen capacity in the haemoglobin.

Blood volume is regained slowly in severe cases of dehydration. There must first be a regeneration of destroyed cells and protein (Utheim, Keith, Marriot). If dehydration is continued for a period of time, there is a tendency for constriction of peripheral arterioles and a stagnation of corpuscles in the small peripheral vessels. The electrocardiogram shows a disturbance in the cardiac mechanism with a low amplitude in all waves. This condition resembles that which occurs in coronary sclerosis or the hardening of the blood vessels which supply the heart with blood. The pulse becomes weak and rapid while the blood pressure remains normal to low.

The effects of dehydration on the kidney are quite noticeable. The amount of urine is rapidly decreased as the colloidal osmotic pressure of blood approaches the renal pressure in the renal arterioles. Traces of albumen and casts are present in the urine. Reducing sugars are excreted, and evidence of impaired functional activity of the kidneys is shown by increased blood urea. There is a tendency for the retention of acids normally excreted causing an acidosis much the same as that in chronic nephritis.

The function of heat elimination is also seriously interfered with in moderate to severe dehydration. Fever is almost certain to occur when not enough water is present for evaporation. In some cases this is quite important, resembling desert thirst.

As to the ultimate effect of occasional mild dehydration, very little is actually known. Crisler reports that animals are much more susceptible to the effects of depressive drugs while in a dehydrated condition. There are some theories that resistance to disease is lowered, but little actual proof is available. Most animals show a remarkable and rapid recoverey from short periods of dehydration, but whether or not some functional disturbance remains is not well proven. Space does not permit a discussion of all the functional disturbances which may occur. However, it is not the purpose of this article to give advice with regard to the practice of weight cutting by means of dehydration or otherwise. There has merely been an attempt to set forth as briefly as possible the physiological effects which are definitely known.

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ABOUT STATIC ELECTRICITY

I. What is a charge of electricity?

Static charges of electricity occur in two forms, viz.: positive charges and negative charges. We now know that a negative charge consists of an aggregate of small particles called electrons and that a positive charge consists of an aggregate of small particles called protons. These electrons and protons may with equal correctness be considered particles of matter or particles of energy. When they are considered as particles of matter we find that the mass of the proton is approximately equal to that of the hydrogen atom. The mass of the electron, which is the unit of negative electricity, is only 1/1800 of that of the proton.

According to the modern theory of matter, the atom of any element consists of a nucleus whose mass is made up mostly of protons, surrounded by revolving electrons. The protons in the nucleus are held firmly together by means of attracting electrons embedded with them to form a highly concentrated mass. About one-half of the electrons of a complicated atom are held firmly in the nucleus. The other half are revolving in surrounding orbits. The total number of electrons in a neutral atom is just equal to the total number of protons in the nucleus. Furthermore, the negative electric charge of an electron is equal to the positive electric charge of the proton, with the result that a normal atom is in a neutral state as regards electrification. Some of the outer electrons of a complicated atom are held rather loosely in their orbits. When certain substances are heated, these electrons break away, leaving the surface of the substance positively charged. Rubbing glass with a silk cloth or sealing wax with a woolen cloth, causes electrons to leave the surface atoms of one of the two substances and cling to the other. When glass is rubbed with silk, electrons leave the surface atoms of the glass and collect on the silk. Thus the glass becomes positively charged due to unneutralized protons, and the silk becomes negatively charged. When sealing wax is rubbed with a woolen cloth, the electrons are freed from the surface atoms of the wool and gather on the sealing wax. The result is that the sealing wax becomes negatively charged leaving the wool positively charged. In the light of modern theory, it is not difficult to understand why the generation of one form of electricity is always accompanied by the generation of an equal amount of the other form.

The Greek philosopher Thales about 600 B. C. found that when amber was rubbed it acquired the property of picking up light objects, such as bits of dry wood. So far as history tells, he did not recognize that there were two kinds of electric charges. In the 16th century Sir William Gilbert, physician to Queen Elizabeth, found that there are many substances which when rubbed acquired this property of picking up light objects. He called these objects ''electrics'' which was the first use of this term. Still later in France in the early part of the 18th century Du Fay discovered that there really were two kinds of charges which he called vitreous and resinous. And, finally, toward the close of the 18th century, Benjamin Franklin labeled the charges positive and negative.

In our times we know that anything rubbed will develop electrification. Some objects called non-conductors, such as glass, wool, leather, paper, wood, will retain the charge when rubbed; others, called conductors, such as metals, will lose their charges when rubbed, as quickly as they are generated unless they are completely surrounded by an insulating medium. This medium will usually consist of two parts, an insulating support, and the air.

Some two years ago the question ''What is electricity?'' was asked in a first grade county certificate teacher's examination. Many students who took this examination at the Iowa State Teachers College were unable to answer the question. In fact, they were quite indignant about it, believing that is was not a fair question. They had been led to believe that no one knows what electricity is. Quite a number of these applicants came to the writer after the examination in physics and were surprised to hear that negative electricity consists of an aggregate of particles called ''electrons'' and that positive electricity consists of an aggregate of particles called ''protons''.

In discussing electricity, it will do no harm to emphasize the fact that there is no division of natural science today that is more accurately understood as regards its nature and principles than is electricity. We probably do not know all about it; but the vast knowledge of it that is definitely known can be accurately stated in mathematical formulas and equations.

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