medical sciences

Gathered at the International Conference on Biological Effects of Carbon monoxide in New York last week

CARBON MONOXIDE

Ocean as source

Several potential sinks or scavenging processes that would eliminate carbon monoxide from the lower atmospheres have been discussed by scientists. Although the ocean has been considered as one sink, Dr. J. W. Swinnerton of the Naval Research Laboratory in Washington, D.C., suggests that the ocean may act as a source rather than a sink for carbon monoxide.

Dr. Swinnerton studied the distribution of carbon monoxide between the atmosphere and surface waters of the North Atlantic Ocean on two recent oceanographic cruises. The first cruise was between Washington, D.C., and Puerto Rico and the second concentrated on an area east and south of Barbados.

The net transport of carbon monoxide across the air/sea interface appears to be from the sea into the atmosphere, says Dr. Swinnerton. Photochemical reactions probably contribute to the production of carbon monoxide, he says.

Assuming that there are similar production rates throughout the world oceans, Dr. Swinnerton says, the ocean may be the largest known natural source of this gas—contributing as much as 5 percent of the amount generated by burning of fuels by man.

PHYSIOLOGY

Monoxide tolerance developed

The toxicity of carbon monoxide results from its ability to combine with a number of physiologically important pigments, such as iron and oxygen compounds. Its affinity for hemoglobin to form carboxyhemoglobin is so much greater than for other compounds that in mammals it is believed this formation causes the most important effect because it cuts down on the oxygen-carrying ability of the blood.

However, Dr. Arthur B. Otis of the University of Florida in Gainesville found that mice exposed to moderate concentrations of carbon monoxide for extended periods of time built up a certain tolerance to the gas so that less carboxyhemoglobin was formed. Results showed that erythrocytes, the red blood cells that carry oxygen, were increased in those animals exposed to carbon monoxide. According to Dr. Otis, this increases the capacity of the blood to carry oxygen.

NEUROLOGY

Cerebral function effects

Carbon monoxide can severely derange the central nervous system, but precisely what functions are impaired has not been clearly defined (SN: 11/22, p. 480).

To study the effects of carbon monoxide on cerebral function, Dr. Rodney R. Beard of Stanford University School of Medicine in Stanford, Calif., used large doses in up to 25 patients.

Results showed that the ability to discriminate the duration of sound about one second long was reduced in proportion to the concentration of carbon monoxide in the air. A significant decrease was seen with 50 parts per million for 79 minutes, a dose that produces less than the 2 percent carboxyhemoglobin in the blood often seen in some metropolitan areas.

In a test where subjects estimated the passage of time, the performance again was decreased with increasing carbon monoxide doses. A highly significant decrement was seen when exposure reached 50 parts per million for 64 minutes, the physician says.

ARTERIOSCLEROSIS

Carbon monoxide and cholesterol

Arteriosclerosis has often been linked with smoking, but it has not been shown that nicotine alone causes the disease. Recently, high concentrations of carboxyhemoglobin, the substance formed when carbon monoxide combines with hemoglobin in the blood, have been observed in smokers with arterial disease, but the reason has remained obscure.

In an effort to determine the influence of carbon monoxide on the cardiovascular system, Dr. Poul Astrup of Rigshospitalet in Copenhagen exposed cholesterol-fed rabbits to low concentrations of the gas for eight to ten weeks. Results, he says, show that the concentrations of cholesterol in the arteries were 2.5 times higher in a group of animals having 15 percent carboxyhemoglobin for the first eight weeks and 30 percent for the last two weeks than in the control group.

Even when the rabbits were not given cholesterol, he adds, carbon monoxide exposure induced arterial lesions marked by fatty deposits.

Dr. Astrup believes that the atherogenic effects of carbon monoxide may be due to its increasing the permeability of vascular walls, making it easier for fatty proteins to filtrate into the vessels.

PHYSIOLOGY

Tissue changes found

Although it is known that carbon monoxide in high enough doses affects performance as a result of insufficient oxygen being supplied to the central nervous system, the question of whether the gas causes any tissue changes is still open to debate.

According to Dr. Thomas J. Preziosi of Johns Hopkins University in Baltimore, recent studies have shown that high concentrations of carbon monoxide, as well as comparable levels of decreased oxygen, produce a variety of tissue changes in the central nervous system of dogs. Dr. Preziosi says that both the muscle fibers of the heart and the white matter in focal areas of the brain were dramatically destroyed.

Furthermore, he reports that low concentrations over a longer period of time (50 to 100 parts per million for 6 weeks) have produced similar, though less severe, changes. The normal ventricles of the heart were dilated and the white matter tissue of the brain was similarly lost.