CHAPTER VI

The Mode of Entry and Action of Toxic Materials

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The toxicity of a material and the hygienic standard or threshold limit applying to its use are of considerable interest, but they must not be confused with the hazards of using the material. Gases may replace all of the air in the atmosphere while the amount of vapor in the atmosphere at any time is limited by the vapor pressure of the liquid or solid from which it arises. The amount of suspended particulate matter, for instance, dust, mist, or fume, in the atmosphere, however, is not limited by vapor pressure. There is also some evidence that particulates may absorb gases and vapors, thereby altering and in some instances increasing their physiological action. Gases and vapors of low solubility in water as well as those sorbed by particles of micron size tend to exert their action in the lower respiratory tract.

In order to plan the prevention of injury from toxic materials in industry it is essential that we have a clear understanding of how these materials enter the body, how they act therein, and how they are eliminated. In order better to understand these processes, we should understand respiration and circulation and their role in absorption and elimination. This in turn necessitates an understanding of the gas laws, with an ability to apply them to the solution of gases in liquids and, specifically, in the body fluids. We need also to know how different materials act upon the body and to understand the different types and degrees of physiological response.

I. Classification of Contaminants

The earth is surrounded by a gaseous atmosphere of rather fixed composition: 78.09 per cent nitrogen, 20.95 per cent oxygen, 0.93 per cent argon, 0.03 per cent carbon dioxide, insignificant amounts of neon, helium, and krypton, and traces of hydrogen, xenon, radioactive emanations, oxides of nitrogen, and ozone, with which may be mixed anywhere up to 5.0 per cent water vapor. Any of these gases in greater proportion than usual, or any other substance present in the atmosphere, may be regarded as a contaminant, or as atmospheric pollution. The possibilities of contamination are legion, but we may classify them according to their physical state, their chemical composition, or their physiological action.