mists, fumes, dusts. Also asphyxiation, irritation of lungs—acute (edema, pneumonitis), irritation of lungs—chronic, pneumoconiosis, fibrosis, emphysema, and granuloma (Be). In addition cancer of lung, deposition—radition within lung and hilar lymph nodes; specific carcinogenic agents are hazards. Ingestion of chemicals, following upper-respiratory trapping of dusts, following contamination of hands and handling things that go into mouth and following contamination of food stored in work rooms—eaten in dirty lunch rooms are potential dangers.

(2) nature of hazard—aspect of absorption—systemic effects such as: acute intoxication, percutaneous, respiratory, alimentary absorption (often two or all three combined); chronic intoxication—remote enzymatic or metabolic effects and organic damage; or remote radiation effects following absorption and distribution of radioactive materials in body—example—bone and marrow, following absorption, distribution and metabolism of specific carcinogins—example—bladder tumor.

RECOGNITION AND IDENTIFICATION OF HAZARDS

1. Toxicologic investigation (in laboratory) (stepwise with progress of research and development in industry)
   (a) screening—preliminary choice or elimination of materials under consideration—
   —immediate toxicity—indicative of type of control measures based on portal of entry (type and point of application of preventive procedure) (degree of precision required in protection, i. e. extent of apparent danger) (medical criteria—type of anticipated-injury or disease)
   (b) Comprehensive—(adapted to the problems to be met)
   —manufacturing hazards
   —hazards of transportation and use as raw materials by others
   —hazards of consumer of final product
   —cumulative effects if any
   —metabolic fate in body—remote effects—long-term—chronic—injurious effects
   —diagnostic and prognostic procedures based on results of investigation
2. Toxicologic investigation—(in plant) clinical investigation of personnel
   —basis of all specifications for safe environment
   —sometimes the only basis for recognition of hazard, e. g. beryllium, occupational cancer

CONTROL OF HAZARDS

1. Medical measures of control—environmental—(operations, plant conditions and (how men work)
   —clinical examination—all types.
   —policing the plant—(clinical findings and tests on personnel)
   —identification and quantitation of responses to observed exposure—within physiological (tolerable) limits—beyond physiological limits
   —warning of need for further protection
   —disposition of personnel with respect to exposure restriction of time (duration) of exposure—removal from exposure —temporary or permanent
   —personal protective equipment (choice and supervision, physiological criteria) adequacy of equipment employed—adequacy of its maintenance—adequacy of its use
   —education, group meetings, written instructions, hygienic manual, combined with operating manual
   —reports to engineering personnel (in both operations and industrial hygiene) and to management
2. Engineering measures of control
   —designing and applying measures of control—physical devices for protection against chemicals—plant design—operations design—ventilating design
   —policing the plant (environmental monitoring) inspection—critique of maintenance operations—analysis of materials —air analyses.
   —personal protective equipment (choice and supervision—engineering criteria)
   —reports to medical personnel, and management (directly or through physician)

3. Administrative measures of control
   —appropriate organization of hygienic facility in relation to operations
   —appropriate budgetary provision for hygienic effort

Adequate control depends upon the complete understanding of the hazard through *physiologic and toxicologic research.*

In addition, satisfactory team work includes:

1. Physician (including nurse and technicians) measures applied to personnel measures to be applied to environment (hygienic specifications)
2. Engineer (including chemist, physicist and technicians) measures to be applied to environment (hygienic technologic applications)
3. Management
   proper organization
   proper financial implementation

LIVING IN THE AIR WE BREATHE

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Living in the air we breathe has been a problem since God created man from dust and then breathed into him the breath of life! But even today, the vital role of breathing in our daily life has not been completely appreciated. This paper reviews briefly (1) air contaminants, and (2) commercially available respiratory protective devices, with emphasis on their limitations, and on the training and maintenance necessary for safe and effective use.

Each of us is a creature of habits, but none of our habits is more vital to life than is breathing. So automatic and effortless is this habit that we give almost no thought to our respiration, although most of us cannot live without air for more than five minutes. From the second of our birth when we descend from in utero (where the oxygen partial pressure corresponds to 33,000 feet altitude) into a world with a mixture of gases called air, we must breathe several quarts of air each minute so our body cells can exist, grow, and perform their functions.

For an average lifetime of 70 years, we may breathe in excess of a half billion times. By contrast, we consume "three square meals" and "six glasses of water" daily. Our air requirements which we obtain virtually without effort are of greater significance by any standards than water, food, clothing, and shelter, which demand much "day-by-day" thought and deliberate action to obtain.

We live at the bottom of an ocean of air called the atmosphere, a name given to a mixture of several gases which consist mainly of *four-fifths nitrogen and one-fifth oxygen.* Virtually limitless in volume and mass as we view it from the ground, it thins out into space. Half of its density is under 18,000 feet. In a multitude of ways the air assists all living things to exist.

FUNCTIONS OF AIR

Besides providing oxygen for breathing-oxygen which lungs transfer to the blood—air conveys both sound and light, absorbs heat, enables fires to burn, propels boats, turns windmills, makes possible air brakes, vacuum cleaners, and other useful machines. Air in motion forms winds which modify climate, equalize heat and cold, and distribute rainfall. Rivers high in the air, such as the jet stream, greatly influence weather and are an increasingly important factor as airplanes travel at higher altitudes. The ancient Greeks ranked air with earth, fire and water as one of the four fundamental elements.

Since each of us has been breathing several times each minute from our birth, respiratory protection and devices to aid or *supplement breathing might seem unnecessary.* If pure air were truly ubiquitous, and no harmful gases, vapors or dusts existed,