commissurotomy. JAMA 182:208, 1960
14 Nichols HT, Morse DP, Blanco G, et al: Open Heart
16 Davila JC: Prosthesis and living tissue: Conflict compat-
17 Braunwald NS, Detmer DE: A critical analysis of the
status of prosthetic valves and homografts. Prog Cardio-
vasc Dis 11:113, 1968
18 Beall AC Jr, Bricker DL, Meumun BJ: Results of mitral
valve replacement with Dacron velour-covered Teflon-disc
and the Beall mitral prosthesis. Ann Thorac Surg 10:20-
28, 1970
20 Robinson MJ, Hildner FJ, Greenberg JJ: Disc variance of
21 Fischman NH, Edmonds LH, Hutchinson JC, et al: Five-
year experience with the Starr-Edwards aortic and mitral
leaks and hemolytic anemia following insertion of Starr-
Edwards aortic and mitral valves. J Thorac Cardiovasc
23 Favaloro RG, Effer DB, Groves LR, et al: Surgical repair
of leaking prosthetic heart valves. Ann Thorac Surg 3:503-
513, 1967
24 Najafi H, Dye WS, Javid H, et al: Mitral valve replace-
ment. Review of seven years experience. Ann J Cardiol
54:396-395, 1969

Oxides of Sulfur as Air Pollutants

Of the 3,000 chemicals found in the air, oxides of
sulfur, byproducts of modern technology, have been
recognized as harmful atmospheric agents since their
massive onslaught on human health in London, England
(1958) and New York City (1953 and 1968). Recurrent
exacerbations of respiratory and mortality attributable to them in
other metropolitan and industrial communities the world over attest to the persistence of this serious envi-
ronmental problem. These oxides result from the combi-
nation of sulfur contained in coal and oil of which huge
quantities are being used currently. Coal cleaning, coke
production, petroleum refining, public utilities, paper
mills, aluminum, copper, lead and zinc smelting, a great
many other manufacturing processes, transportation ind-
ustry (air planes, diesel engines), heating and air con-
ditioning of residential and commercial buildings are
sources of enormous amounts of oxides of sulfur. Oil
found in California, Pennsylvania and in the South are
relatively low in sulfur, sometimes well under 1 percent.
Venezuelan oil contains 2-3 percent, Near Eastern oil 3-
4 percent or more. During the past several years, autho-
rative research studies in human and experimental ani-
mals have offered persuasive pertinent information.
Sulfur oxides in the ambient air may result in pulmonary
growth, increased capillary permeability, interstitial
inflammation and thickening of alveolar septa. The latter is enhanced by swollen alveolar epithelial and mononuclear cells, lymphocytes and fibroblasts. These
changes interfere with alveolar gas diffusion. Also, there
may be an interference with lung tissue metabolism and
slowing of enzyme function. Thus, decrease in cholin-
terase is conducive to bronchospasm which, in turn,
hinders ventilatory mechanics of the lung by increased
resistance to air flow. Slowing or transient cessation of
bronchial ciliary motion impairs pulmonary homeostasis.
Some individuals show allergic response to sulfur dioxid-
ne, the latter, in others, increases the severity of bron-
chial asthma. Experimental animals, whose lungs were
rendered emphysematous by aerosolized papain, mani-
fested increased lung compliance and reduction of lung
recruit following daily inhalations of sulfur dioxide. Ac-
cording to reliable estimates, 26 million tons of sulfur
dioxide are emitted into the atmosphere in the United
States annually. Sulfur dioxide may cause severe bron-
chitis, pneumonia and pulmonary edema. Pathogenic
microorganisms contribute to the severity of these
pneumonic changes. As reemphasized by Molely
(Aerosp Med 48:1106, 1971), air pollution aggravates
preexisting respiratory and circulatory diseases. More-
over, Hodgson (Environ Sci Technol 4:369, 1970) un-
derscored the fact that mortality from respiratory and
heart diseases is significantly related to the level of air
pollution. This challenge has led to the establishment of
NAPCA (National Air Pollution Control Administra-
tion) and EPA (Environmental Protection Agency).
The latter's primary standards for the protection of pub-
lic health were set for sulfur oxides in April 1971: 80
micrograms per cubic meter (0.03 ppm) annual arith-
metric mean and 95 micrograms per cubic meter (0.14
ppm) as maximum 24-hour concentration not to be
exceeded more than once a year.

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CHEST, VOL. 62, NO. 3, SEPTEMBER, 1972

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