

## Appendix A

### Other pollutants

#### A.1 Sulphur dioxide

SO<sub>2</sub> normally does not penetrate beyond the upper airways (Bridgman, 1990). High concentrations only cause death in cases of previous respiratory disease, such as emphysema, and generally affect older people more seriously than younger people in good physical condition (Ross, 1972). At concentrations below 20 pp. m, only acute effects are experienced (Wark & Warner, 1981). Bronchi constriction in healthy people is likely at concentrations from 1000 to 2000 pp. b, with a lower threshold for sensitive persons and small children between 500 and 750 pp. b (Egenes, 1999). The impact of SO<sub>2</sub> on human health related to various dosages is summed up in Table A.1.

**Table A.1: Symptoms in humans related to various dosages of SO<sub>2</sub>** (WHO (2000) cited in Burger & Scorgie (2000a; 3-12); Burger & Scorgie (2000b))

Symptoms	Concentrations (pp. m)	Duration of exposure
Lung edema; bronchial inflammation	400	
Eye irritation; coughing in healthy adults	20	
Decreased mucociliary activity	14	1 hour
Bronchospasm	10	10 minutes
Throat irritation in healthy adults	8	-
Increased airway resistance in healthy adults at rest	5	10 minutes
The maximum allowable concentration in which it is considered possible for a healthy human being to work for eight hours	5	
The gas has a pungent, irritating odour	3	
Increased airway resistance in asthmatics at rest and in healthy adults at exercise	1	10 minutes
Increased airway resistance in asthmatics at exercise	0.5	10 minutes
Odour threshold	0.5	
Aggravation of chronic respiratory disease in adults	0.19	24 hours
Excess mortality may be expected among the elderly and people suffering from respiratory illnesses	0.18	24 hours
Aggravation of chronic respiratory disease in children	0.07	Annual <sup>(1)</sup>
Lowest levels at which adverse health effects noted	0.07	24 hours

<sup>(1)</sup> Occurs in the presence of high concentrations of particulate matter

#### A.2 Carbon monoxide

A high concentration is considered anything more than 750 pp. m (Wark & Warner, 1981). Sources are regarded as cigarette smoking, automobile exhaust, fossil fuel combustion, and other types of domestic heating (Ross, 1972). It can have the following effects on a person's health (Strauss & Mainwaring, 1984):

- a. Heart disease,
- b. Heart function has been shown to be altered,

- c. Blocks the transport of oxygen in the bloodstream, and
- d. Can cause physiological and pathological changes and ultimately death.

### A.3 Oxides of Nitrogen

Nitric oxide (NO) and Nitrogen dioxide (NO<sub>2</sub>) causes the biggest health problems (Wark & Warner, 1981). Sources include internal combustion engines, gas turbines, oil-fired-, coal fired furnaces and incinerators (Bagg, 1971). NO<sub>2</sub> is only potentially irritating and potentially related to chronic pulmonary fibrosis (Bridgman, 1990). Adverse effects due to acute NO<sub>2</sub> exposure, such as pulmonary edema, usually do not show up until many hours after the exposure has ended (Burger & Scorgie, 2000a). Symptoms related to various doses of NO<sub>2</sub> are outlined in Table A.2 (Burger & Scorgie, 2000a). At the lowest NO<sub>2</sub> exposure levels (0.5 pp. m) at which adverse health effects have been detected, pathological changes have been found to include the destruction of cilia, alveolar tissue disruption and the obstruction of the respiratory bronchioles (Burger & Scorgie, 2000a). NO<sub>x</sub> are responsible, together with SO<sub>2</sub>, for acid rain and contribute indirectly to photosmog and the greenhouse effect (American Association for the Advancement of Science, 1965 cited in Wark & Warner, 1981: 156).

**Table A.2: Symptoms related to various dosages of NO<sub>2</sub>** (Lutz (2000); Egenes (1999); Harrison (1990) Strauss & Mainwaring (1984); Wark & Warner (1981); Ross (1972); Bagg (1971); Strauss, 1971 (cited in Burger & Scorgie, 2000: 3-17); American Association for the Advancement of Science (1965 cited in Wark & Warner, 1981))

Symptoms	Concentrations (pp. m)	Duration of exposure
Rapid death	300	-
Death after 2-3 weeks by bronchiolitis fibrosa obliterans	150	-
Reversible, nonfatal bronchiolitis	50	-
Impairment of ability to detect odour of NO <sub>2</sub>	10	-
Impairment of normal transport of gases between blood and lungs in healthy adults	5	15 minutes
Increased airway resistance in healthy adults	2.5	2 hours
Increased airway resistance in bronchitis	1.0	15 minutes
Odour perception threshold of nitrogen dioxide	0.12	-

### A.4 Hydrocarbons

To date, the effects of ambient air concentrations of gaseous hydrocarbons have not demonstrated direct adverse effects upon human health (Strauss & Mainwaring, 1984). Hydrocarbons can have some adverse effects on health, but it is difficult to generalize their effect on the human body (Strauss & Mainwaring, 1984). Some affect the operation of certain body organs when indigested in very small quantities while others have a relatively high threshold level (Strauss & Mainwaring, 1984).