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Air Pollution and Primordial Prevention of Chronic Non-Communicable Diseases

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1. Introduction

Air pollution is a global health issue with serious public health implications particularly for children. Studying the effects of environmental factors on the early stages of atherosclerosis can serve for future studies and offer strategies for primary prevention of chronic disease.
Usually respiratory effects of air pollutants are being considered, this chapter highlights the importance of non-respiratory health hazards from early life. In addition to short-term effects, exposure to criteria air pollutants from early life might be associated with low birth weight, increase in stress oxidative and endothelial dysfunction which in turn might have long-term effects on chronic non-communicable diseases.
The independent association of air pollutants with surrogate markers of endothelial dysfunction and a possible pro-coagulant state is underscored. Similar independent associations are documented for air pollutants and hematologic parameters as well as a possible pro-inflammatory state. The presence of these associations with PM_{10} (larger than $PM_{2.5}$ usually considered as harmful) and in a moderate air quality (which is commonly considered with few or no health effect for the general population) highlights the need to re-examine environmental health policies and standards for the pediatric age group.
Atherosclerosis begins in early life, and the role of platelets is well-documented from its early stages. The concern of medical literature on atherosclerotic cardiovascular diseases is mostly about some specific inflammatory diseases, and the role of environmental factors, as air pollution is overlooked in many studies. Many studies have documented that disturbance of the inflammatory and the coagulation systems after exposure to air pollution might be a factor in endothelial dysfunction and the progression of cardiovascular diseases**.** The increase in platelets number and aggregation may be a surrogate marker of early hematologic and hemostatic changes due to air pollutants. The systemic pro-inflammatory and pro-coagulant response to inhalation of fine and ultrafine particulate matters suggest a role for platelet activation in this process.
Facilities should be provided for families to become aware of the quality of the air year-round and to check daily air-quality levels and air-pollution forecasts by mass media, local weather reports and other available public information sources. This is especially important for smog levels during hot weather. Protective measures should be taken into account for children and pregnant women to reduce their exposure to air pollutants, e.g. children and pregnant women should avoid congested streets and rush hour traffic, moreover families

should try to limit the amount of time their child spends outdoors in vigorous activity if the air quality is unhealthy.
In view of the emerging epidemic of chronic disease in low- and middle- income countries, the vicious cycle of rapid urbanization in such communities resulting in increasing levels of air pollution and its consequent effects on chronic diseases, as well as the limited financial resources of these countries for planning effective air pollution control programs, public health and regulatory policies for air quality protection should be integrated into the main priorities of primary health care system and into the educational curriculum of health professionals.

2. Health hazards of air pollution

Air pollutants have many adverse effects on various body organs with short- and long-term health consequences. A summary of the health hazards of air pollution is presented in Table 1.

3. Susceptibility of children health to air pollutants

Infants and children are among the most susceptible age groups for air pollutants, because they may have greater exposure than adults to air pollutants, this is especially important during summer time with highest smog levels; they have higher respiratory rates than adults, and consequently higher exposure to air pollutants. The mouth breathing of infants and children bypass the filtering effect of the nose, and they would inhale higher levels of pollutants than adults. Children generally spend significantly more time outdoors than adults, In addition, the children's immune systems and developing organs are still immature (Kim, 2004).

4. Long-term effects of air pollutants on children's health

Air pollutants have various adverse effects from early life, some of the most important harmful effects are perinatal disorders, infant mortality, respiratory disorders, allergy, malignancies, cardiovascular disorders, increase in stress oxidative, endothelial dysfunction, mental disorders and vitamin D deficiency. However, till now most focus has been on the short-term respiratory effects of air pollution on children's health. In this chapter, we highlight the wide range of hazards of air pollution from early life, and their possible implication on chronic non-communicable diseases of adulthood.
The late-onset effects of air pollution in early life may be related to many chronic diseases later in life. Most chronic non-communicable diseases originate from early life, however studies about the relationship of environmental factors, notably air pollution, with risk factors of chronic diseases are scarce in children and adolescents.

5. Exposure to air pollutants in early life and chronic diseases in adulthood

Many studies have documented the effects of criteria air pollutants on low birth weight and or prematurity .There is a growing body of evidence about the association of intrauterine growth retardation and low birth weight with increased risk of chronic non-communicable diseases such as obesity, hypertension and cardiovascular disease later in life (Sinclair et al., 2007). Furthermore, prematurity can be associated with higher risk of chronic diseases (Evensen et al., 2008).

Reference	Location	Population studied	Aims	Findings
Mengersen et al. (2011)	Lao PDR (one of the least developed countries in Southeast Asia)	the first study that investigated indoor air quality and its impact within residential dwellings in Lao PDR	study on the association between measured air pollutants and the respiratory health of resident women and children	There was a strong and cor between NO(2) and CO for health outcomes for both w dwellings with higher mea of the odds of almost all of concentrations of NO(2) ar associated with lower PEF
Kaplan (2010)	Review	-	This review focuses on the contribution of solid fuels to indoor air pollution .	The incomplete combustion byproducts with well-know increasing the risk of many conditions are acute respira obstructive pulmonary dise cancer, cataracts and blindn adverse pregnancy outcom
Dennekamp &Carey (2010)	USA			Health effects : lung (↓func airway reactivity , Exacerbation of asthma ar Exacerbation of cardiovasc
Cao et al., (2010)	China	70,947 middle-aged men and women in the China National Hypertension Survey and its follow-up study. Baseline data were obtained in 1991 and follow-up evaluation was conducted in 1999 and 2000.	association of air pollution with mortality using proportional hazards regression model.	We found significant assoc and mortality from cardiop cancer. Each 10μg/m(3) ele was associated with a 0.9% 2.3%, 4.0%), and 2.3% (95% cardiovascular mortality, re
Nandi &Gorain (2010)	India	population of Durgapur town	detect the effect of pollution on human health. Two parameters, i.e., modes of transport and travelling time were chosen for this analysis.	There is pollution effect on of significance. Only heada paper.

Reference	Location	Population studied	Aims	Findings
Nandasena et al., (2010)	Sri Lanka	PUBMED and Medline databases, local journals and conference.	PUBMED and Medline databases, local journals and conference proceedings were searched for epidemiologic studies pertaining to air pollution and health effects in Sri Lanka	Sixteen studies investigated to ambient or indoor air po outcomes ranging from res weight and lung cancers. C control design. Half of the s only through questionnaire between air pollution and a Methodological limitations poor quantification of risk e
Yoshioka et al., (2010)		investigated cytokine production and nuclear factor-kappaB (NF-kappaB) activation after stimulation of macrophage cells by exposure of urban aerosols.	evaluated the induction of airway inflammation in vitro and in vivo due to exposure of urban aerosols	urban aerosols induce respi inflammatory disease due t system.
Layshock et al., (2010)	China	this is the first report of dibenzopyrenes in the Beijing atmosphere and among the few studies that report these highly potent PAHs in ambient particulate matter .	Size fractionated particulate matter (PM) was collected in summer and winter from Beijing, China for the characterization of an expanded list of PAHs and evaluation of air pollution metrics.	Lifetime risk calculations in over 6 out of 100 Beijing res of lung cancer due to PAH lifetime risk was attributed
Longo et al., (2010)	on the island of Hawai'i	Kilauea Volcano population . Using a within-clinic retrospective cohort design, comparisons were made for visits of acute illnesses .	assess for a relative increase in cases of medically diagnosed acute illnesses in an exposed Hawaiian community.	There were statistically sign between high vog exposure diagnosed cough, headache airway problems.

Reference	Location	Population studied	Aims	Findings
Adar et al., (2010)		participants (46 to 87 years of age) were without clinical cardiovascular disease at the baseline examination (2000-2002). Subcohort of MESA cohort study .	investigate cross-sectional associations between long- and short-term air pollution concentrations and microvascular characteristics using arteriolar vessel diameter as measured by retinal photography in MESA .	greater air pollution concen be associated with widened Among the 4,607 participan were found to be narrower regions with increased long- and short-t
Balakrishnan et al., (2010)	Editorial , India		For Integrated Urban–Rural Frameworks for Air Pollution and Health-Related Research in India	In an effort to close existing Medical Research (ICMR) h Advanced Research in Env on air pollution and examin outcomes in a rural–urban an adult endovascular dise modeling and select gene–e also being examined in a ne center will engage in capac resource needs by developi categories of professionals.
Siddique et al. , (2010)	Delhi , India	cross-sectional study 969 school-going children (9-17 years) and 850 age- and sex-matched children from rural areas were assessed,	The prevalence of attention-deficit hyperactivity disorder (ADHD) was assessed in two childhood populations.	ADHD was found in 11.0% contrast to 2.7% of the cont factors were male gender, l 14 year age group, and PM ADHD was more prevalent rural areas. It was prevalent amo Delhi against 4.0% of the gi

Reference	Location	Population studied	Aims	Findings
Tung et al . (2010)	Taiwan	Total of 3741 children was enrolled in the Taiwan Children Health Study from 14 communities.	investigate the associations of EPHX1 Tyr113His, His139Arg and GSTP1 Ile105Val polymorphisms with asthma and wheezing outcomes, and focused on the functional genetic change in different ambient NO(2) levels, GSTP1 and GSTM1 genotypes.	Children with high EPHX1 asthma and wheezing outc through airway oxidative s
Zhou et al., (2010)	China	Meta-analysis method was used to polysynthetically analyze 16 quantitative studies about the	associations between particulate air pollution and stroke daily attack or mortality.	There are positive associati daily attack and mortality, associated with stroke attac increase in PM(10) was ass stroke daily attack and 0.70 mortality . As for PM(2.5) μ g/m(3) increase in stroke mortality.
Power et al., (2010)	USA	In a Cohort of Older Men 680 older men (mean ± age 71± 7 y) between 1996 and 2007.	To assess the association between black carbon, a marker of traffic-related air pollution, and cognition in older men.	The association between bl linear and black carbon esti analyses . Ambient traffic- associated with decreased c
Novaes et al. , (2010)	São Paulo, Brazil	A panel study involving 55 volunteers was carried out in São Paulo, Brazil.	To explore the clinical relevance of chronic exposure to ambient levels of traffic derived air pollution on the ocular surface.	Subjects exposed to higher pollution reported more oc presented greater tear film ocular discomfort symptom used as convenient bioindic of traffic derived air polluti

Reference	Location	Population studied	Aims	Findings
Phalen et al., (2010)	USA	?	the doses delivered to subjects inhaling air-pollutant particles, the concept of a dose metric (also called an indicator) has emerged. An ideal dose metric has the following properties : it is measurable; it is expressible in physical and temporal scientific units; and it has a causal relationship to one or more biological responses	Recent advances include a l aerosol dosimetry of the inf on dose, including various obstructive pulmonary disease and bro physiological characteristic including transport of UF p olfactory nerves and through the lun lung resulting in localized l dosimetric modeling.
Puett et al., (2010)		Using two prospective cohorts, the Nurses' Health Study (NHS) and the Health Professionals Follow-Up Study (HPFS),	investigated the relationship of incident type 2 DM with PM2.5, PM10, and PM10-2.5 exposures in the prior 12 months and distance to roadways.	results did not provide stro between exposure to PM in DM, however an associatio marker of exposure to traff among women.
Zhuang et al., (2010)	Beijing , China	The monitoring data of daily air pollution, along with the daily numbers of outpatients visits at the Allergy Department of Beijing Shijitan Hospital from April to September in 2004 were collected.	assess the effects of ambient air pollutants on hospital outpatient visits for allergic disease and pollinosis.	significant positive associat airborne pollen and doctor 2.44% (95%CI: 0.75% - 4.13% (95%CI: 3.82% - 9.34%) for p mm(2) increase in pollen, in results suggest that level of stronger effect than ambien and pollinosis.

Reference	Location	Population studied	Aims	Findings
Dadvand et al . , (2010)	northeast of England	used registry-based data on congenital heart disease for the population of the northeast of England in 1985-1996.	Investigate the association between maternal exposure to ambient air pollution and congenital heart disease	The authors found a weak a exposure to black smoke ar cardiac chambers and conn as a continuous variable. W exposure, odds ratios did n for consecutive quartiles. F not indicative of any associ
Poursafa,&Kel ishadi , (2010)			The effect of air pollution on inflammatory and pro-thrombotic factors implicated in the progression of cardiovascular diseases.	The systemic pro-inflamma to the inhalation of fine and seemingly associated with may have a clinical signific of cardiometabolic risk fact anti-platelet treatment.
Szyszkowicz et al. (2010)	Canada	Emergency visit data were collected in a hospital in Vancouver, Canada	Therefore the effects of ambient air pollution on emergency department (ED) visits for suicide attempts were investigated.	The results indicate a poten pollution and emergency d attempts. Suicide attempts depression may be linked t
Brunekreef et al.,(2009)	Netherlands	a randomly selected subcohort of 5000 older adults participating in the ongoing Netherlands Cohort Study (NLCS) on diet and cancer.	the effects of traffic-related air pollution by analyzing associations with cause-specific mortality, as well as lung cancer incidence	traffic-related air pollution, related to cardiopulmonary
Carmichael et al., (2009)	Asia	Asia calculated over a 4-year period	Aerosol distributions in Asia calculated over a 4-year period and constrained by satellite observations of aerosol optical depth (AOD) are presented.	Black carbon (BC) concentr representing 5-10% of the t significantly to atmospheri is approximately 55% of tha

Table 1. Summary of harmful health effects of air pollutants

Reference	Location	Population studied	Aims	Findings
Nurkiewicz et al., (2008)		closer examination by toxicologists of vascular responses following PM exposure	impairment of endothelium-dependent dilation	Increased systemic inf oxidative stress
Simpson R et al., (2005)	Austria	Brisbane, Melbourne, Perth and Sydney population	investigating the health effects of air pollution on daily mortality	Strongest associations dioxide and ozone. Fo in PM2.5 concentratio approximately a 1% in deaths.
Pope et al., (2002)	USA	The risk factor data for approximately 500 000 adults were linked with air pollution data for metropolitan areas	To assess the relationship between long-term exposure to fine particulate air pollution and all-cause, lung cancer, and cardiopulmonary mortality	each 10 mg/m3 elevat pollution was associat and 8% increased risk lung cancer mortality,
Lewis PR et al ., (1998)		La Trobe Valley		Respiratory morbidity with outdoor air pollu

The relationship of long-term traffic exposure (NO2 level by residence) and diabetes mellitus is documented (Brook et al., 2008). The first biological support for this finding comes from our study that demonstrated an independent association of exposure to air pollutants, notably PM_{10}, with markers of insulin resistance among children and adolescents (Kelishadi et al.,2009), as cited in the statement of the American Heart Association (Brook et al.,2010).

These findings suggest that the systemic responses to long-term exposure to air pollutants could potentially increase the risk for development of the metabolic syndrome, hypertension and diabetes mellitus.

Some study findings on the association of air pollution with surrogate markers of atherosclerotic cardiovascular diseases in children and adolescents is presented in Table2.

Reference	Location	Population studied	Aims	Findings
Inflammation, Coagulation, Oxidative stress				
Poursafa & Kelishadi (2010)	Review	Review on the effects of air pollution on platelets	The increase of platelet count and platelet hyper-reactivity towards agonists are emerging as markers of hematologic and hemostatic changes in response to the exposure to air pollutants. The systemic pro-inflammatory and pro-thrombotic response to the inhalation of fine and ultrafine particulate matters is seemingly associated with platelet activation.	It is of particular relevance to further study the significance of platelet activation and anti-platelet therapies in primordial/primary preventive measures in children and adolescents at risk of accelerated atherosclerosis.
Kelishadi et al.(2009)	Isfahan,Iran	A population-based sample of children aged 10-18 years (n=374)	To determine the association of air pollution as well as dietary and physical activity habits with markers of inflammation, oxidative stress and insulin resistance	The Pollutant Standard Index (PSI) and the level of fine particulate matter had significant independent association with all biomarkers studied.

Reference	Location	Population studied	Aims	Findings
Yang et al.(2008)	Review	Review of studies on air pollution and chronic obstructive pulmonary diseases, cardiovascular diseases, asthma, and cancer	To provide some insight about the health problems associated with various air pollutants and their relationship in promoting chronic diseases through changes in oxidative stress and modulation of gene expression	Byproducts of oxidative stress found in air pollutants are common initiators or promoters of the damage produced in chronic diseases.
Chuang et al., (2007)	Taipei, Taiwan	Young healthy university students (n=76)	To investigate whether biological mechanisms linking air pollution to cardiovascular events occurred concurrently in human subjects exposed to urban air pollutants	Air pollution is associated with inflammation, oxidative stress and blood coagulation in healthy young humans.
Endothelial dysfunction				
Poursafa et al.(2011)	Iran	Healthy children	To assess the relationship of air pollution and plasma surrogate markers of endothelial dysfunction in the pediatric age group	The independent relationship of air pollutants with endothelial dysfunction and a pro-coagulant state can be an important factor in atherosclerosis development from early life.

Reference	Location	Population studied	Aims	Findings
Brook (2008)	Review	Review of studies on air pollution and cardiovascular diseases	To address the cardiovascular effects of air pollution and related mechanisms	Air particle exposure may both trigger acute events as well as prompt the chronic development of cardiovascular diseases, one of the mechanisms is by triggering acute endothelial dysfunction.
Nadadur et al., (2007)	USA	Differential gene expression and transcription factor activation profiles in human vascular endothelial cells exposed to a non-cytotoxic dose of fly ash or V following semi-global gene expression profiling of approximately 8000 genes.	To explore potential biomarkers for PM-induced endothelial dysfunction	Cardiovascular effects associated with exposure to PM may be mediated by perturbations in endothelial cell permeability, Membrane integrity; and ultimately endothelial dysfunction.

Table 2. Summary of studies assessing the effects of criteria air pollutants on inflammation, coagulation, oxidative stress and endothelial dysfunction among children and young adults

6. Environmental factors, lifestyle behaviors and chronic diseases

Usually improper lifestyle habits and low educational levels have been considered as the underlying process of the role of low socio-economic position in early life as a predisposing factor for future chronic diseases (Power, et al., 2007) and mortality (Strand & Kunst, 2007), the exposure to air pollutants and its effects on low birth weight and premature birth might have an additional role in this regard.

Lifestyle modifications and strengthening primary care in health system are suggested as the main strategies to prevent and control chronic diseases in low- and middle-income countries (Miranda et al., 2008).

The association between air pollution and chronic diseases may be mediated through systemic inflammatory responses (Brook et al., 2004; Holgate et al. 2003). Generating

reactive oxygen species is considered to be linked to a variety of environmental factors. The association of air pollution and inflammation/oxidative stress has been demonstrated (Huang et al., 2003; Ruckerl et al. 2006; Chuang et al., 2007), even among healthy children (Kelishadi et al., 2009) who might have the early stages of atherosclerosis. Such association is also confirmed for air pollutants, notably particulate matters and surrogate markers of endothelial dysfunction and markers of vascular injury (Poursafa et al., 2011). The effects of air pollution on inflammation, coagulation, oxidative stress and endothelial dysfunction from early life confirm the necessity of implications of these findings in relation to public health and regulatory policies for primordial/primary prevention and control of adult chronic diseases from childhood.

The prevalence of malignancies are rapidly accelerating worldwide. Although lifestyle behaviors as smoking (Dominguez et al., 2006), as well as unhealthy dietary and physical activity habits leading to obesity and diabetes are known as a major contributing factor in this regard (Hjartåker et al.,2008), air pollution should be considered as another potential risk factor for developing countries(Nejjari et al.,2003) especially Asian countries , where cancer has become an emerging health threat (Park et al.,2008).This issue is particularly important for children who are susceptible to short-term and long-term effects of air pollutants.

7. Conclusion

Air pollution is a global health issue with serious public health implications particularly for children. Usually respiratory effects of air pollutants are being considered, the importance of other health hazards should be highlighted. In addition to short-term effects, exposure to criteria air pollutants from early life might have long-term hazards principally on chronic non-communicable diseases as cardiovascular diseases and cancers. In view of the emerging epidemic of chronic disease in low- and middle- income countries, the vicious cycle of rapid urbanization in such communities resulting in increasing levels of air pollution and its consequent effects on chronic diseases, as well as the limited financial resources of these countries for planning effective air pollution control programs, public health and regulatory policies for air quality protection should be integrated into the main priorities of primary health care system and into the educational curriculum of health professionals.

We suggest that environmental protection activities, particularly for reducing the emission of criteria air pollutants, should be considered for public health measures taken into account for primordial/primary prevention of chronic diseases especially in developing countries.

8. References

Adar SD, Klein R, Klein BE, Szpiro AA, Cotch MF, Wong TY, O'Neill MS, Shrager S, Barr RG, Siscovick DS, Daviglus ML, Sampson PD, Kaufman JD. (2010).Air Pollution and the microvasculature: a cross-sectional assessment of in vivo retinal images in the population-based multi-ethnic study of atherosclerosis (MESA). *PLoS Med.*7(11):e1000372.

Balakrishnan K, Dhaliwal RS, Shah B. (2010). Integrated urban-rural frameworks for air pollution and health-related research in India: the way forward. *Environ Health Perspect*, 119(1), a12-14

Brook RD, Jerrett M, Brook JR, Bard RL, Finkelstein MM.(2008). The relationship between diabetes mellitus and traffic-related air pollution. *J Occup Environ Med*. 50:32-38.

Brook RD, Franklin B,Cascio W. (2004).Expert Panel on Population and Prevention Science of the American Heart Association. Air pollution and cardiovascular disease: a statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. *Circulation.*109:2655-2671.

Brook RD, Rajagopalan S, Pope CA 3rd, Brook JR, Bhatnagar A, Diez-Roux AV,Holguin F, Hong Y, Luepker RV, Mittleman MA, Peters A, Siscovick D, Smith SC Jr, Whitsel L, Kaufman JD; American Heart Association Council on Epidemiology and Prevention, Council on the Kidney in Cardiovascular Disease, and Council on Nutrition, Physical Activity and Metabolism. (2010).Particulate matter air pollution and cardiovascular disease: An update to the scientific statement from the American Heart Association. *Circulation.* 121(21):2331-2378.

Brunekreef B, Beelen R, Hoek G, Schouten L, Bausch-Goldbohm S, Fischer P.(2009).Effects of long-term exposure to traffic-related air pollution on respiratory and cardiovascular mortality in the Netherlands: the NLCS-AIR study. *Res Rep Health Eff Inst.* (139):5-71.

Cao J, Yang C, Li J, Chen R, Chen B, Gu D, Kan H. (2010).Association between long-term exposure to outdoor air pollution and mortality in China: A cohort study. *J Hazard Mater*.[Epub,ahead of print]

Carmichael GR, Adhikary B, Kulkarni S, D'Allura A, Tang Y, Streets D, Zhang Q, Bond TC, Ramanathan V, Jamroensan A, Marrapu P. (2009).Asian aerosols: current and year 2030 distributions and implications to human health and regional climate change. *Environ Sci Technol.* 43(15):5811-5817.

Chuang KJ, Chan CC, SuTC. (2007).The effect of urban air pollution on inflammation, oxidative stress, coagulation, and autonomic dysfunction in young adults. *Am J Respir Crit Care Med*.176,370-376.

Dennekamp M, Carey M.(2010). Air quality and chronic disease: why action on climate change is also good for health. *N S W Public Health Bull.* 21(5-6):115-121.

Dominguez LJ, Galioto A, Ferlisi A, Pineo A, Putignano E, Belvedere M, Costanza G, Barbagallo M. (2006).Ageing, lifestyle modifications, and cardiovascular disease in developing countries. *J Nutr Health Aging*.10,143-149.

Evensen KA, Steinshamn S, Tjønna AE, Stølen T, Høydal MA, Wisløff U, Brubakk AM, Vik T. (2008).Effects of preterm birth and fetal growth retardation on cardiovascular risk factors in young adulthood. *Early Hum Dev.*85,239-245.

Hjartåker A, Langseth H, Weiderpass E. (2008).Obesity and diabetes epidemics: cancer repercussions. *Adv Exp Med Biol.* 630,72-93.

Holgate ST, Devlin RB, Wilson SJ, Frew A J. (2003). Health effects of acute exposure to air pollution. Part II: Healthy subjects exposed to concentrated ambient particles. *Res Rep Health Eff Inst*.112:31-50.

Huang SL, Hsu MK, Chan CC. (2003).Effects of submicrometer particle compositions on cytokine production and lipid peroxidation of human bronchial epithelial cells. *Environ Health Perspect*.111:478-482.

Kaplan C. (2010). Indoor air pollution from unprocessed solid fuels in developing countries. *Rev Environ Health*; 25(3),221-242.

Kelishadi R, Mirghaffari N, Poursafa P, Gidding SS. (2009). Lifestyle and environmental factors associated with inflammation , oxidative stress and insulin resistance in children. *Atherosclerosis.* 203:311-319.

Kim JJ; American Academy of Pediatrics Committee on Environmental Health. Ambient air pollution: health hazards to children. (2004). *Pediatrics*.114:1699-1707.

Layshock J, Simonich SM, Anderson KA.(2010). Effect of dibenzopyrene measurement on assessing air quality in Beijing air and possible implications for human health. *J Environ Monit.* 12(12),2290-2298.

Lewis PR, Hensley MJ, Wlodarczyk J, Toneguzzi RC, Westley-Wise VJ, Dunn T. (1998). Outdoor air pollution and children's respiratory symptoms in the steel cities of New South Wales. *Med J Aust.*169,459-463.

Mendez LB, Oldham MJ. (2010). New developments in aerosol dosimetry. *Inhal Toxicol.* 22 Suppl 2:6-14.

Miranda JJ, Kinra S, Casas JP, Davey Smith G, Ebrahim S.(2008). Non-communicable diseases in low- and middle-income countries: context, determinants and health policy. *Trop Med Int Health,*13,1225-1234.

Nandasena YL, Wickremasinghe AR, Sathiakumar N. (2010).Air pollution and health in Sri Lanka: a review of epidemiologic studies.BMC Public Health. *Biol Pharm Bull*.33,780- 783.

Nandi PK, Gorain GC. (2010).Effect of traffic pollution on health of the people at Durgapur (India). *J Environ Sci Eng.* 52,167-172.

Nejjari C, Filleul L, Zidouni N, Laid Y, Atek M, El Meziane A, Tessier JF. (2003). Air pollution: a new respiratory risk for cities in low-income countries. *Int JTuberc Lung Dis*. 7,223-231.

Novaes P, Saldiva PH, Matsuda M, Macchione M, Rangel MP, Kara-José N, Berra A. (2010).The effects of chronic exposure to traffic derived air pollution on the ocularsurface. *Environ Res*.110:372-374.

Nurkiewicz T, PorterD, Hubbs A, Cumpston J, Chen B, Frazer D, Castranova A.(2008). Nanoparticle inhalation augments particle-dependent systemic microvascular dysfunction. *Part Fibre Toxicol.* 9 ,1

Park S, Bae J, Nam BH,Yoo KY. (2008). Aetiology of cancer in Asia. *Asian Pac J Cancer Prev.* 9,371- 380.

Pope CA 3rd, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, Thurston GD. (2002).Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *JAMA*.287,1132-1141.

Poursafa P, Kelishadi R.(2010). Air pollution, platelet activation and atherosclerosis. *Inflamm Allergy Drug Targets.*9,387-92.

Poursafa P, Kelishadi R, Lahijanzadeh A, Modaresi M, Javanmard SH, Assari R, Amin MM, Moattar F, Amini A, Sadeghian B. (2011).The relationship of air pollution and surrogate markers of endothelial dysfunction in a population-based sample of children. *BMC Public Health.* 11(1):115. [Epub ahead of print]

Power C, Atherton K, Strachan DP, Shepherd P, Fuller E, Davis A, Gibb I, Kumari M, Lowe G, Macfarlane GJ, Rahi J, Rodgers B, Stansfeld S. (2007).Life-course influences on health in British adults: effects of socio-economic position in childhood and adulthood. *Int J Epidemiol,* 36,532-9.

Power MC, Weisskopf MG, Alexeeff SE, Coull BA, Spiro Iii A, Schwartz J. (2010).Traffic-related air pollution and cognitive function in a cohort of older men. *Environ Health Perspect.* [Epub ahead of print]

Puett RC, Hart JE, Schwartz J, Hu FB, Liese AD, Laden F. (2010). Are Particulate Matter Exposures Associated with Risk of Type 2 Diabetes? *Environ Health Perspect.* [Epub ahead of print]

Rankin J, Rushton S, Pless-Mulloli T,Dadvand P. (2011).Association between maternal exposure to ambient air pollution and congenital heart disease: A register-based spatiotemporal analysis. *Am J Epidemiol.* 173,171-182.

Ruckerl R, Ibald-Mulli A, KoenigW. (2006). Air pollution and markers of inflammation and coagulation in patients with coronary heart disease. *Am J Respir Crit Care Med.*173,432-441.

Siddique S, Banerjee M, Ray MR, Lahiri T. (2010).Attention-deficit hyperactivity disorder in children chronically exposed to high level of vehicular pollution. Eur J Pediatr. [Epub ahead of print]

Simpson R, Williams G, Petroeschevsky A, Best T, Morgan G,Denison L. (2005).The short-term effects of air pollution on daily mortality in four Australian cities. *Aust N Z J Public Health.* 29,205-212.

Sinclair KD, Lea RG, Rees WD, Young LE. (2007).The developmental origins of health and disease: current theories and epigenetic mechanisms. *Soc Reprod Fertil* Suppl. ,64,425- 443.

Strand BH, Kunst A. (2007).Childhood socioeconomic position and cause-specific mortality in early adulthood. *Am J Epidemiol*. 165,85-93.

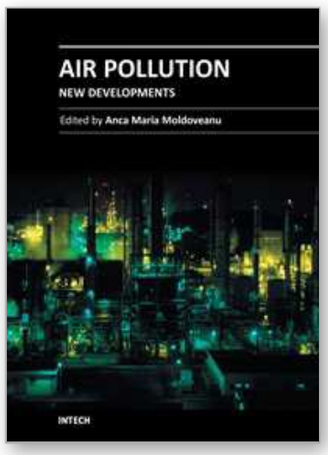
Szyszkowicz M, Willey JB, Grafstein E, Rowe BH, Colman I. (2010). Air pollution and emergency department visits for suicide attempts in vancouver, Canada. *Environ Health Insights.* 4,79-86.

Tung KY, Tsai CH, Lee YL. (2010). Microsomal Epoxide Hydroxylase Genotypes/Diplotypes,Traffic Air Pollution and Childhood Asthma. *Chest.* [Epub ahead of print]

Yoshida T, Yoshioka Y, Fujimura M, Kayamuro H, Yamashita K, Higashisaka K. (2010).Urban aerosols induce pro-inflammatory cytokine production in macrophages and cause airway inflammation in vivo. *Biol Pharm Bull.*33, 780-783.

Zhou Y, Li XY, Chen K, Ye XJ, Shen Y. (2010).Association between air particulate matter and stroke attack or mortality: a Meta-analysis. *Zhonghua Liu Xing Bing Xue Za Zhi.* 31,1300-1305.

Zhuang Y, Sun XM, Wang XY, Shi HY, Zhang ZG, Wang Q. (2010). [The influence of ambient air pollutants on outpatient visits for allergic disease and pollinosis.]. *Zhonghua Yu Fang Yi Xue Za Zhi.* 44,1121-1127.



Air Pollution - New Developments

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Today, an important issue is environmental pollution, especially air pollution. Due to pollutants present in air, human health as well as animal health and vegetation may suffer. The book can be divided in two parts. The first half presents how the environmental modifications induced by air pollution can have an impact on human health by inducing modifications in different organs and systems and leading to human pathology. This part also presents how environmental modifications induced by air pollution can influence human health during pregnancy. The second half of the book presents the influence of environmental pollution on animal health and vegetation and how this impact can be assessed (the use of the micronucleus tests on TRADESCANTIA to evaluate the genotoxic effects of air pollution, the use of transplanted lichen PSEUDEVERNIA FURFURACEA for biomonitoring the presence of heavy metals, the monitoring of epiphytic lichen biodiversity to detect environmental quality and air pollution, etc). The book is recommended to professionals interested in health and environmental issues.

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