

**THE OUTDOOR POLLUTION EFFECTS PRODUCED BY TWO
TYPES OF SOURCES ON HEALTH STATUS AND COMFORT
OF REZIDENT POPULATION**

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Abstract. An irritant pollution generated by different sources even at moderate level justifies the investigation of early effects both on health and life quality of the resident population. The authors present the results of two epidemiological studies carried out during 1999-2000; the first one about the health effects of pollution around a representative antibiotics factory and the second one of pollution generated by a controlled waste landfill. Morbidity data collected by our usual information system have been used. The relationship between the health status and exposure have been investigated on samples of 86 schoolchildren from the antibiotics factory surrounding area and 135 from the municipal waste landfill neighborhood area *versus* 88 and respectively, 473 unexposed subjects. Although, the results doesn't reveal the presence of early symptoms or of a specific pathology, the quality of life seems deeply damaged; though there are different sources of pollution in this areas, all investigated persons specified antibiotics factory and waste landfill as the cause of discomfort. Therefore, an investigation on the discomfort was carried out on these children and a representative sample of adults subjects (262) living in surrounding area of waste landfill.

Key words: irritant air pollution, respiratory diseases and symptoms, epidemiological studies, opinion questionnaire

Rezumat. Poluarea atmosferică iritantă din diferite surse și la concentrații moderate justifică cunoașterea primelor efecte asupra sănătății sau a calității vieții populației rezidente. Autorii prezintă rezultatele a două studii epidemiologice realizate în perioada 1999-2000 pentru efectele determinate de poluarea produsă de o mare fabrică din industria medicamentelor (antibiotice) și un depozit controlat de deșeuri menajere. Studiile utilizează datele de morbiditate colectate prin sistemul nostru curent de informație, datele privind sănătatea în relație cu expunerea pentru un eșantion probabilist de 86 școlari din zona fabricii de medicamente și 135 din localitatea învecinată depozitului de reziduuri *versus* 88 și respectiv, 473 de neexpuși, datele privind efectele de disconfort la acești copii dar și la un eșantion de 262 adulți din vecinătatea depozitului. Rezultatele nu evidențiază boli constituite și nici simptome de debut, dar există o afectare a calității vieții prin disconfortul cu aspecte multiple. Deși în zonă există și alte surse de poluare, persoanele investigate recunosc drept cauză a disconfortului, sursa incriminată.

Cuvinte cheie: poluare atmosferică cu iritanți, boli și simptome respiratorii, studii epidemiologice, anchetă de opinie pentru disconfort

INTRODUCTION
Irritant outdoor air pollution (different
as intensity and complex as content)

is one of the most frequent and
widespread.

Even in the less industrialized areas in towns of different urbanization levels with a traffic more or less developed, the irritant pollution is almost permanent (1,2).

Its chronic effects, frequently ignored by the population, consist in a higher incidence of respiratory diseases or just only respiratory symptoms (3,4,5). The effects are more frequent in children, due to their vulnerable age, anatomical and functional particularities. The environmental contaminants, associated with adverse effects on health can be investigated in different ways. Among these, the epidemiological investigation permits to evaluate the effects of low level pollution, although it is difficult to select both control and study cohorts, as well as to quantify the exposure (6,7,8).

Regarding the exposure data the intensity of pollutant concentration and the exposure time, must be considered.

Concerning the possible effects of air pollution on population health, two different sources have been investigated: the Antibiotics Factory and the Municipal Controlled Waste Landfill both working in the outskirts of Iasi, the biggest city in northeastern Romania.

This paper is a component part of an extended epidemiological investigation on air pollution effects in population living in eastern Romania.

MATERIAL AND METHOD

The aim of the ecological studies was to compare the health status of exposed children group with an unexposed one with a similar structure

of age, sex, socio-economical and familial conditions.

The selected territories and subjects included:

- 3 rural localities and a control one (A Study: 86 schoolchildren aged between 7-11 y) for the pollution exposure around "S.C. Antibiotic" factory;
- one suburban area (B Study: 135 schoolchildren) for the pollution exposure produced by municipal waste landfill.

The samples represented 21.8% and 17.7% of total schoolchildren in A and B studies, respectively.

The intensity of exposure was evaluated from updated previous measurements. The duration of exposure was equally with child's age which was born and grows up there. The health status evaluation included a medical history using a WHO Standard Respiratory Symptoms Questionnaire followed by complete medical examination (9,10,11).

Additionally, each child asked to describe the discomfort feeling, if any. The control group of A study consisted of 88 children, residents in a rural opposite area without any industrial unit. For B group study two control groups (473 subjects) living in a distant district, have been chosen observing with the same age structure.

- the investigation on the discomfort created by waste landfill was carried out on 262 adults (2.2% of the total population over 16 y) living in close vicinity, in a face to face interview by a validated questionnaire.

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RESULTS AND DISCUSSION

The A study was carried out in 3 rural areas, around antibiotics factory.

The major air pollution components found in all air samples were:

- fungi with variable concentration but always over those measured in control area (12);
- NH₃ and NO₂, in higher concentrations than the Maximum Allowable

Concentration (MAC) (13), especially in warm seasons.

Other air pollutants originate in motor traffic and some local sources of organic pollution.

The data of a health survey made in 1998 on resident population, comparatively with those of controls as incidence rates of respiratory, skin and allergic diseases are indicated in table 1.

Table. 1 Incidence rate of different diseases in exposed vs unexposed resident population (1998)

	Exposed Localities			Exposed	Unexposed	E/U Ratio
	1	2	3			
No. of med. exam/y/pers.	2.2	2.9	2.4	2.4	2.1	1.14
Incidence rate (no.cases/10 ³ people)	185.6	134.3	178.9	166.8	87.6	1.90
Conjunctivitis	8.6	10.3	13.8	10.9	18.4	0.59
Rhinitis	3.5	4.7	0.5	2.9	2.0	1.45
Pharyngitis	76.8	36.4	87.1	85.3	7.7	11.07
Laryngitis	31.4	7.1	2.9	13.7	4.7	2.91
Allergic rhynitis	1.7	2.8	0	0.9	1.0	0.90
Spastic bronchitis	31.9	1.0	0	10.9	0.7	15.57
Asthma	0.9	0.3	0	0.4	0	0.40
Skin (dermatitis, bacterial and fungal infections)	30.7	16.9	39.4	29.1	13.7	2.12

Overall, in exposed territories, the annual incidence rate was twice than that of control area. Pharyngitis and spastic bronchitis were the mostly frequent diagnostics as well as the skin disorders such as dermatitis and fungal or bacterial infections.

The results of this baseline cross sectional survey are of limited value because of multiple variables of the general population. Consequently, a representative sample of 86 school-

children aged between 7 and 11 y have been selected and health status evaluated comparatively with 88 matched controls. Although, the incidence rates of different diseases during the year before our examination indicated higher values to exposed children, total incidence of acute diseases does not differ significantly (fig. 1). The results of our clinical examination (as prevalence rates) are presented in table 2.

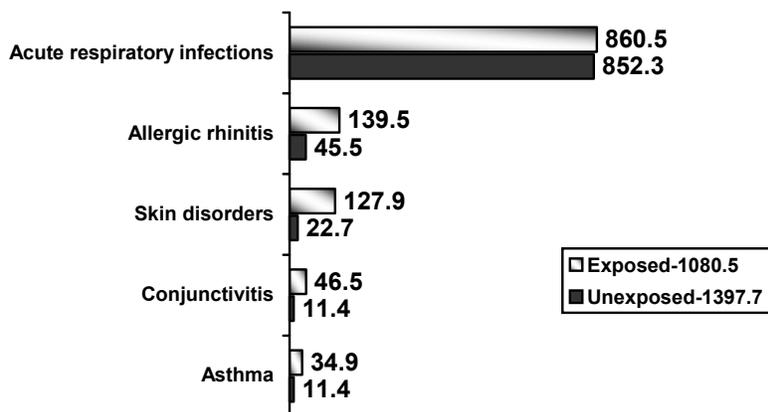


Fig. 1 The annual incidence rate of some diseases in exposed vs unexposed children

Table 2. The prevalence of diseases in exposed vs unexposed children (%)

	Exposed (n=86)	Unexposed (n=88)	p value
Momentary prevalence	39.8	32.3	p>0.05
Prevalence on disease:			
Acute rhinitis	9.3	4.5	p>0.05
Respiratory virosis	9.3	0	
Chronic rhinitis	3.5	2.3	p>0.05
Acute pharyngitis	3.5	1.1	p>0.05
Adenoiditis	3.5	4.5	-
Hypertrophied Tonsils	1.2	3.4	-
Chronic sinusitis	2.6	3.4	-
Acute sinusitis	1.2	1.1	p>0.05
Bronchitis	1.2	1.1	p>0.05
Asthma	1.2	0	-
Conjunctivitis	2.3	4.5	-
Skin disorders	-	1.1	-

An extended range of diseases have been found; of these acute rhinitis and respiratory virosis have had the highest prevalence.

Even when the effects of outdoor air pollution are not a well definite

disease, some signs or symptoms could be specific for host response to pollutant aggression. Beside clinical examination, the WHO Standard Questionnaire concerning respiratory symptoms has been used.

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So, statistically significant differences have been found for chronic cough between exposed children and unexposed ones (96.6% and 75.4%, respectively, $\chi^2=14.2$ $p<0.001$). Additionally, the children were interviewed about how they feel the discomfort: about half of them declared they are affected by smoke,

gas and unpleasant smell and the other half qualified these as unbearable. In unexposed group the corresponding percentages lowered to 8.05% and 16.09%, respectively.

The discomfort signs or symptoms claimed by children are presented in table 3.

Table 3. Discomfort symptoms in exposed vs unexposed children (no. of cases)

Discomfort signs of symptoms	Exposed (n=86)	Unexposed (n=88)	χ^2
Shed tears, eye smarts	12	13	
Cough	20	8	9.54; $p<0.001$
Sneezing crisis	15	5	4.81; $p<0.05$
Headache	5	-	
Irritability	4	-	
Insomnia	3	-	

Asked about the source of air pollution which caused these effects, 40% of exposed children indicated the antibiotics factory; 23% the traffic (10% in unexposed group) 15% the

garbage (16% in unexposed one); 19% the manure (42% unexposed children). Only two signs of discomfort could undoubtedly be attributed to air pollution as table 4 data show.

Table 4. Discomfort signs due to air outdoor pollution

	RR	RA
Cough produced by smell	1.82	45.0
Sneezing crisis	1.63	38.7

In B study carried out nearby of municipal waste landfill, momentary concentrations of NH₃, CO, H₂S over MAC have been recorded. Although this outdoor air pollution level

diminishes with increasing distance from source, it persists up to center, resulting an air pollution index over 1 (table 5).

Table 5. The concentration of some atmospheric pollutants in momentary samples (mg/m³)

Area	Outdoor air pollutants - 2000 y (mg/m ³)			
	NH ₃	CO	H ₂ S	GPI _{CMA}
Waste landfill (50 m)	1.22	11.86	0.12	14.05
Waste landfill (250 m)	1.16	9.83	0.11	8.34
Village school	0.65	5.10	0.06	9.68
Pigs farm	1.28	8.48	0.10	12.35
Village-center	0.53	4.41	0.08	6.51
Old village	0.45	3.73	0.06	6.12
MAC	0.3	6	0.015	≤ 1

The indicators used to evaluate the health status of exposed vs unexposed

schoolchildren proved contradictory results as table 6 data show.

Table 6. The health status of exposed children vs unexposed (%)

	Children		
	Exposed (n=135)	Unexposed ₁ (n=149)	Unexposed ₂ (n=324)
Annual incidence rate	1407.4	295.3	2215.2
Momentary diseases prevalence	13.3	7.4	15.7
Harmonious physical development	66.6	55.0	71.8
Healthy subjects found at medical examination	86.7	92.6	76.8

About the perception of the discomfort produced by unpleasant smell, 26.7% of children considered it as unbearable and responsible for the following signs or symptoms: shed tears, eye smarts, cough (3.7%), headache, nausea (2.9%) giddiness (2.2%).

The investigation on discomfort included also a representative sample of adult population living there. Overwhelming majority of subjects was of active work age (30-49y= 77.9%) and of middle level of education (56.9%). Percentage of resident woman was 55.7%.

Majority of respondents (69.5%) housed in block of flats over a decade; 17.6% were living there between 6 to 10 years and 16.7%, a shorter period of time (under 5 years) with poor living conditions of overcrowded dwellings and high thermic discomfort (winter temperatures under 18°C and over 30°C in summertime).

The blocks of flats are located at different distances of pollution sources as can be seen from table 7.

The different signs or symptoms of discomfort state are shown in figure 2.

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Table 7. Percentage of people living in proximity of pollution sources

Distance (m)	Sources of outdoor pollution		
	Waste landfill	Pigs farm	House garbage container
< 100			56.9
1 - 300			39.3
300 - 500		15.6	3.8
500 - 1000	37.4	78.2	
1000 - 3000	62.2	6.1	
> 3000	0.4		

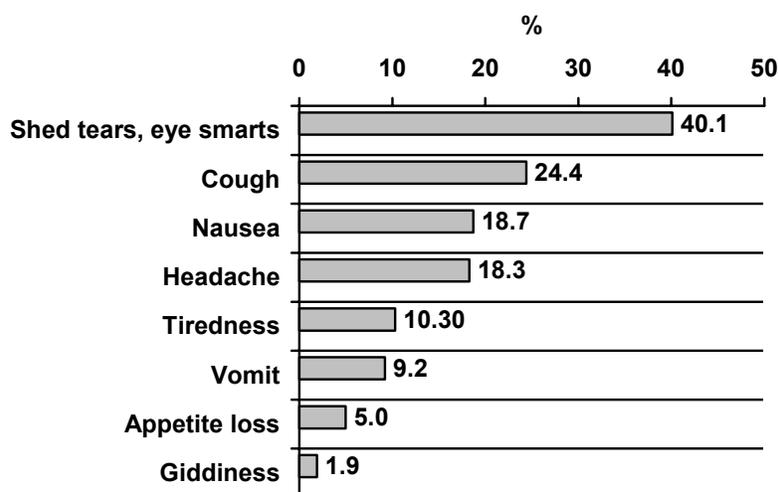


Fig. 2 The percentage of different discomfort signs and symptoms

Besides these effects, the life quality is affected through: difficulties in dwelling ventilation (83.5% of respondents); in outdoor children's activities (45.4%) and the presence of flies-43.5%, mosquitos-81.3%, *Blatta orientalis*-9.2% and rats-31.3%.

As the source of unpleasant smell 72.9% of interviewees indicated the waste landfill; 42.9% the pig farms; 14.9% the domestic waste containers; 7.6% unwholesome basements and 3.8% traffic.

CONCLUSIONS

- The epidemiological studies carried out in two territories in close proximity of a big city point out the air pollution effects produced by two types of sources: a medicines factory with its specific biological pollutants like fungi spore and a waste landfill with an irritant chemical pollution.
- The descriptive study developed on current morbidity data provided limited information.

- The epidemiological study performed in surroundings of antibiotics factory on exposed/ unexposed schoolchildren revealed the discomfort produced by the unpleasant smell, with different frequencies and intensities;
- The neighborhood of waste landfill produced an irritant pollution but the pollutants concentrations didn't determinate clinical effects; the discomfort affected only the life quality of the resident population.

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