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THE ROLE OF THE AIR POLLUTION IN THE CHRONIC OBSTRUCTIVE RESPIRATORY DISEASES

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Air pollution reduction and its impact on public health continually require the control of the pollution sources, the plan of observational studies and the organization of an efficient network of environmental control and a closer study of meteo-climatic factors. Chronic Obstructive Respiratory Diseases due to air pollution have become a social problem of widespread interest. Climatotherapy measures have been executed by means of a new simple electronic instrument measuring the Skin Electric Parameters, i.e. the set of human skin parameters that give an indirect measure of the health status of the patient.

The results of this work show that a climate marked by continuous windy weather, low humidity and high concentrations of negative ions with low concentrations of chemical pollutants (i.e. Pietracupa, Molise, Italy) reduce the need for health care for Chronic Obstructive Respiratory Disease in comparison with what happens in big cities such as Rome.

Keywords: Air pollution; Primary sources; Differential Optical Absorption Spectroscopy; Skin Electric Parameters; Chronic Obstructive Respiratory Disease.

INTRODUCTION

Air pollution is one of the most important environmental factors influencing public health. This paper demonstrates the difference in the role of air pollution in big city and small country town environment. Scientific effort can measure the status of air pollution, but corrective action cycle is based only upon political, social and economic power. It should be necessary to pinpoint and adopt more severe strategies to control the sources of pollution, to formulate a plan on observational studies and on the control of the epidemic, pointing out and fixing the limits of acceptability of concentrated pollutants, to organize an efficient network of environmental control, and to study meteo-climatic factors.

Chronic Obstructive Respiratory Diseases (CORDs), which are caused by air pollution, constitute a social problem of widespread interest [1]. For many years its chronic nature and frequent weakening effects hinder the full development of the psycho-physical potential and of the working and non-working activities of those patients who suffer from them, making heavy inroads on social and sanitary expenditure in terms of loss of working hours and high costs both for the cure and rehabilitation of the patient.

All over the world, "climatic therapy" is a subject of current, contemporary interest even in the treatment of chronic obstructive respiratory pathologies and pollution related illnesses in general.

The present European goal of atmospheric quality ($40 \mu\text{g}/\text{m}^3$ of PM₁₀) should be reviewed in further European rulings and fixed at $20 \mu\text{g}/\text{m}^3$ to permit a further improvement of the effects

of air pollution on health, according to the WHO findings. Similar indications are emerging from the European study [2,3] in the populations of France, Austria and Switzerland: the present levels of pollution are considered responsible for 20,000 deaths per year, for about 25,000 new cases of chronic bronchitis, for about 300,000 cases of acute bronchitis in children and almost 500,000 crises of asthma, causing a financial loss of 16 million working days being lost, equal to 27 billion Euro per year.

MATERIALS AND METHODS

Area investigated

The town of Pietracupa (Molise Region) together with 50 other populated areas are located in the Center of Italy. According to the health information service of the Molise region, in 1998 the three structures acting as hospitals which serve the area of ASL "Centro Molise" receive 344 patients suffering from CORDs at a rate of 2.6 hospitalizations per 1,000 residents.

In Rome there are up to 80 hospitals and clinics with the addition of 14 centers hospitals. Resident population in 2000 year were 2,643,581 inhabitants. In the same year, the CORD hospitalization data published were 5,614 in conventional way and 10,846 in day hospital, bringing the total to 16,460 at a rate of 6.2 patients admitted per 1,000 residents.

Measurements

Climatotherapy measures have been executed by means of a new simple electronic instrument measuring the Skin Electric Parameters (SEP), i.e. the set of human skin parameters giving an indirect measure the health status of the patient [4].

The instrument is simply a ohmmeter based upon a Winston bridge[5,6]. It gives a measure or evaluation of the skin conductance or reduction due to the impact of radiofrequency on the skin. These measures allow to evaluate the meteopathies i.e. pathologies influenced exclusively by direct or indirect atmospheric factors.

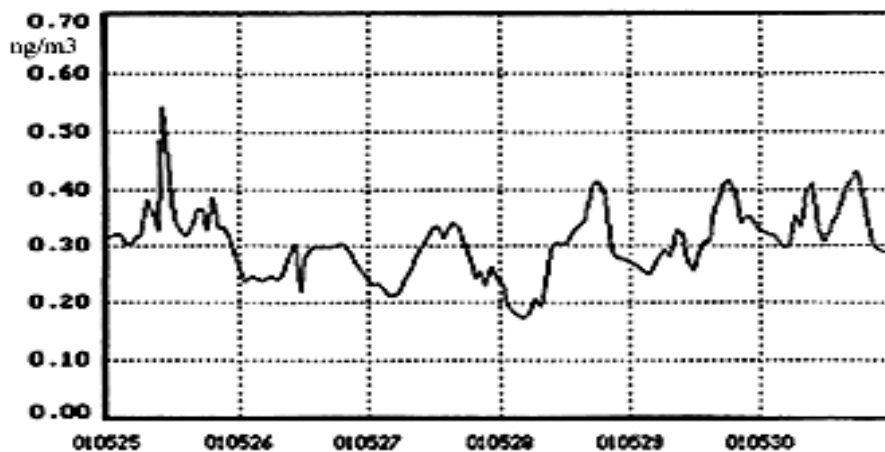


Fig. 1a. Typical weekly CO (ng/m³) trend in Pietracupa.

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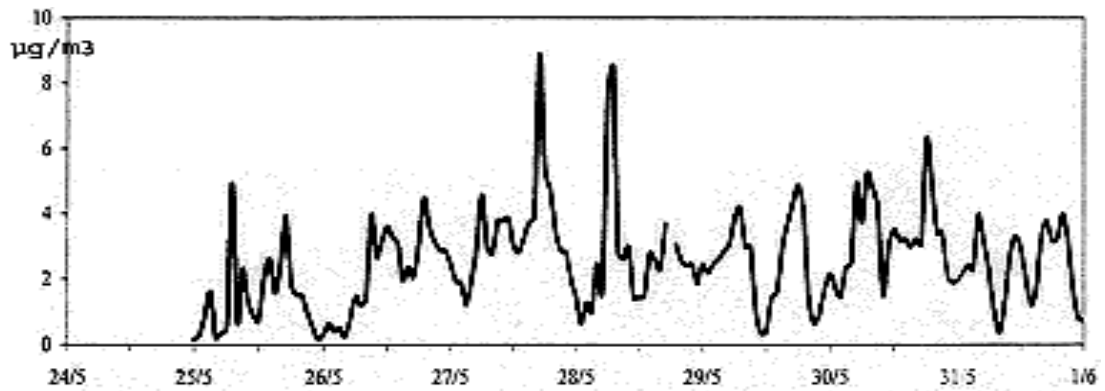


Fig. 1b. Typical weekly NO₂ (µg/m³) trend in Pietracupa.

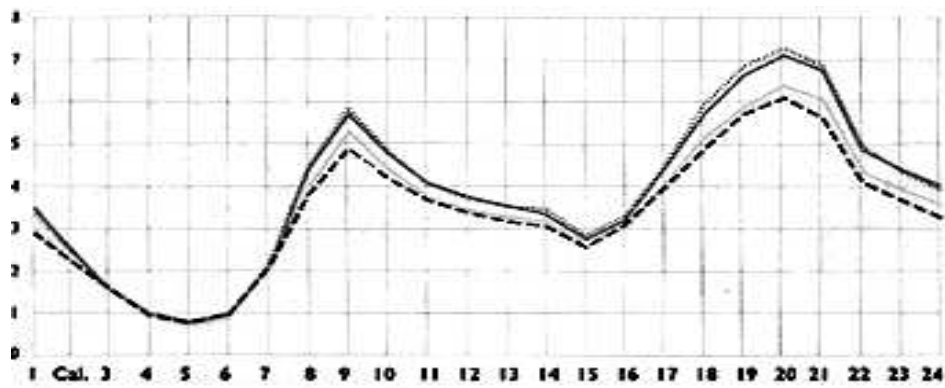


Fig. 2a. Average daily trend of CO (mg/m³) in Rome during the period 1993-96.

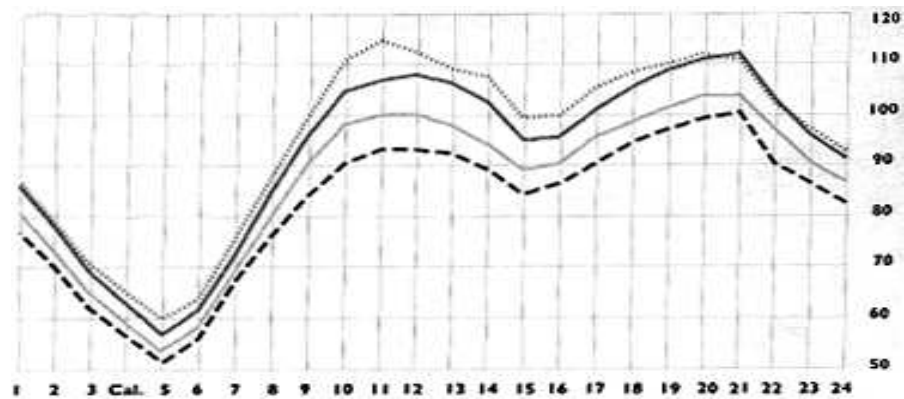


Fig. 2b. Average daily trend of NO₂ (µg/m³) during the period 1993-96.

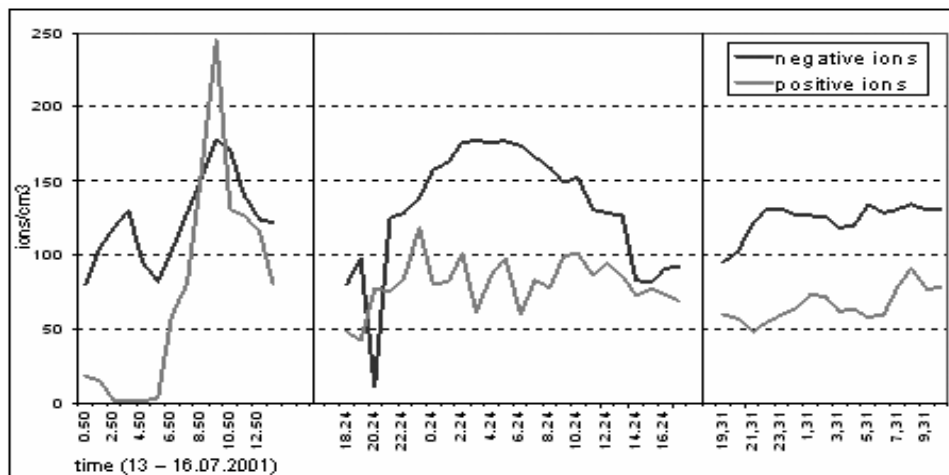


Fig. 3. Daily measurements of ion concentrations (ions/cm³) in Pietracupa.

The Fig. 1 and 2 gives the evaluation of some pollution phenomena at Pietracupa (Middle Molise) and Rome, respectively. Figures 1a and 1b show CO and NO₂ measured in Pietracupa. Fig. 2a and 2b show pollutants measured in Rome. It should be underlined that the effects of these two pollutants on the human health are different and dangerous: CO causes an increase of respiratory and cardiovascular diseases whereas NO₂ causes an increase of respiratory problems. Finally, the Fig. 3 shows Pietracupa ion concentration measures and the Table 1 shows air ionization and subjective description of the environment perception.

RESULTS AND DISCUSSION

The evaluation of the primary pollution was taken by considering the parameters of the particulate, CO, NO₂, and other pollutants, based on wind determinations of the mobile laboratory (Fig. 1-2). The behavior of the mentioned pollutants indicates negligible levels. Benzene and toluene concentrations are so small as to be undetectable. Similar results emerged for sulphur dioxide and for carbon monoxide. In conclusion the air quality analysis in the area of Pietracupa during the campaign period offers a scenario in which pollution, either local and anthropogenic is absent. In a metropolitan area the situation is quite different: a typical example is the Rome case. In such megacity the main problem is caused by primary pollutants, like benzene, particulate matter, elemental carbon. Anthropogenic activities are the dominant pollution sources.

In a small village like Pietracupa, there are no sources of primary pollutants and the primary pollutant levels are very low. Ozone and NO₂ levels are important in the photochemical smog formation. Figure 2 shows some examples of CO in Rome. In particular, benzene and toluene levels are quite high (about 8 µg/m³ and 21 µg/m³) in downtown area versus large towns in various countries. This is essentially due to the motor-vehicle traffic.

The measurements reported in Table 1 show preliminary observations also related to a subjective description of the environment perception. It has been reported in other studies that the concentration of ions is reduced, with an inversion of the ratio between positive and negative ions in heavy traffic cities.

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Table 1.

Air ionization and subjective description of the environment perception.

Place	n ⁻ ions	n ⁺ ions	n ⁻ /n ⁺ ratio	Small ions (K≥1) %	Big ions (K<1) %	Best (+++++) and worst (+) perception
Country, sun, sea, level	306.7	251.6	1.21	88.0	12.0	++++
Sea, quiet, no wind	436.7	354.4	1.23	84.7	15.3	+++++
Mountain 2000 m	560.3	602.5	0.92	92.0	8.0	+++++
Town street no traffic	120.5	108.7	1.10	66.0	44.0	+++
Town street traffic	30.8	150.4	0.20	25.0	75.0	+
Mean value	291.0	293.5	0.93	71.1	28.9	++++ (3.6)
SD	± 218.9	± 197.2	± 0.40	± 27.6	±28.4	± + (1.6)

CONCLUSIONS

This is the first preliminary approach on correlation between air pollution and CORDs including the effects of climate therapy. The trends of some important pollutants are reported and commented for both the sampling sites. Further, a daily measurements of ion concentration are reported: these are the first measures in Italian areas. The absence of air pollution, the high levels of negative ions indicate Pietracupa and Middle Sannio as being the potentially ideal places in which investing resources to implement a project on climatic therapy.

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Руссо М.В., Перроне А., Пизани А., Иалензи В.И., Авино П. Роль атмосферного загрязнения в развитии хронических заболеваний органов дыхания // Учені записки Таврійського національного університету ім. В. І. Вернадського. – 2007. – Серія «Біологія, хімія». – Т. 20 (59), № 1. – С. 101-106.

Уменьшение воздушного загрязнения и его влияние на здоровье людей требуют постоянного наблюдения за источниками загрязнения, мониторинговых исследований и организации эффективной сети экологического контроля и более глубокого изучения метеоклиматических факторов. Хронические заболевания органов дыхания благодаря воздушному загрязнению стали социальной проблемой, что привлекает широкий интерес общественности. Климатотерапевтические исследования были проведены с помощью нового простого электронного инструмента, измеряющего электрические параметры кожи, которые предоставляют косвенное мероприятие оздоровительного статуса пациента. Результаты исследования показали, что климат, сопровождающийся непрерывной ветреной погодой, низкая влажность и высокие концентрации отрицательных ионов с низкими концентрациями химических загрязняющих агентов на курорте Pietrascira, Molise, Италия сокращают уровень хронических заболеваний по сравнению с тем, что имеет место в больших городах, таких, например, как Рим.

Ключевые слова: атмосферное загрязнение, источники загрязнения, дифференциальная оптическая спектроскопия, электрические параметры кожи, хронические заболевания органов дыхания.

Руссо М.В., Перроні А., Пізані А., Іалензі В.І., Авіно П. Роль атмосферного забруднення в розвитку хронічних захворювань органів дихання // Uchenye zapiski Tavricheskogo Natsionalnogo Universiteta im. V.I. Vernadskogo. Series "Biology, chemistry". – 2007. – Vol. 20 (59), № 1. – P. 101-106.

Зменшення повітряного забруднення і його вплив на здоров'ї людей вимагають постійного спостереження за джерелами забруднення, моніторингових досліджень і організації ефективної мережі екологічного контролю і ретельного вивчення метеокліматических чинників. Хронічні захворювання органів дихання завдяки повітряному забрудненню стали соціальною проблемою, що повертає широкий інтерес громадськості. Кліматотерапевтичні дослідження були проведені за допомогою нового простого електронного інструменту, що вимірює електричні параметри шкіри, які надають непрямий захід оздоровчого статусу пацієнта. Результати дослідження показали, що клімат, що супроводжується безперервною повітряною погодою, низька вологість і високі концентрації негативних іонів з низькими концентраціями хімічних забруднюючих агентів на курорті Pietrascira, Molise, Італія скорочують рівень хронічних захворювань у порівнянні з тим, що має місце у великих містах, таких, наприклад, як Рим.

Ключові слова: атмосферне забруднення, джерела забруднення, диференціальна оптична спектроскопія, електричні параметри шкіри, хронічні захворювання органів дихання.