EDITORIAL

Outdoor air pollution and lung cancer: what now?

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In the last decade a substantial number of epidemiological studies suggested that outdoor air pollution and in particular respirable particulate matter (PM10) and fine particulate matter (PM2.5) are associated with an increased risk of lung cancer.

The most recent is a multicentre European study (European Study of Cohorts for Air Pollution Effects - ESCAPE) [1] based on a meta-analysis of 17 cohort studies, globally including more than 300 000 people. This study reported a 22% increase risk of lung cancer with each 10 µg/m3 increase of PM10 in ambient air; such an increase is as high as 51% for the adenocarcinoma histological subtype. In most of the studies, however, PM10 measurements of current or recent calendar periods were related to deaths registered over the last two decades, contradicting the principle that the exposure must occur before disease occurrence.

In a short communication [2] the International Agency for Research on Cancer (IARC) reported that a Working Group *"classified outdoor pollution and particulate matter from outdoor air pollution as carcinogenic to humans (Group 1)"* and that *"the results of this most recent assessment will be published as Volume 109 of the IARC Monographs"*.

The conclusion of the IARC experts is reasonably supported by the control of a wide range of confounders and the evidence of a dose-response relationship in many studies, as well as by the increased risk among non-smokers.

It is not our intention to discuss these issues until the publication of Volume 109, but rather we wish to stress the importance of considering outdoor air pollution as a human carcinogen with reference to the Italian situation.

Firstly, in many Italian cities exposure to ambient air pollutants is substantial and therefore, the number of exposed people is particularly high.

For instance, in Turin city centre, the mean value of PM10 in 2011 [3] was 50 µg/m^3 with peak values as high as 146 µg/m^3. Moreover the measured values exceeded 50 µg/m^3 for 133 days. If the estimate of a 22% increase of lung cancer (and 51% for adenocarcinoma subtype) for each 10 µg/m^3 increase of PM10 is true, there is no need of comments.

The current air quality European Union limit for PM10 is 40 µg/m^3, with an allowance of no more than 35 measurements per year exceeding such value. Thus, the measured values show that large Italian conurbations in the Po Valley are among the most polluted in Europe. Data from table 1 show the average of PM10 levels in 24 of the major Italian urban areas during 2006-2010 [4]: in this classification Turin ranks first and all major conurbations in

TABLE 1

RANKING OF 24 ITALIAN URBAN AREAS ACCORDING TO THE MEAN YEARLY LEVEL OF PM10, AND CORRESPONDING STANDARD DEVIATIONS (SD), 2006-2010

URBAN AREA	RANK	PM10	
		MEAN (µG/M3)	SD (µG/M3)
Turin	1	49.7	35.1
Padua	2	48.4	30.3
Venice-Mestre	3	46.5	31.2
Milan	4	46.3	31.0
Modena	5	40.0	23.4
Treviso	6	38.9	26.2
Bologna	7	38.4	21.6
Piacenza	8	37.8	22.2
Ferrara	9	37.5	22.7
Reggio Emilia	10	36.7	21.0
Florence	11	36.4	16.2
Naples	12	35.8	16.6
Palermo	13	35.7	17.0
Rome	14	34.5	14.1
Parma	15	34.4	19.1
Rimini	16	34.0	17.7
Pisa	17	32.5	13.8
Ancona	18	32.4	14.0
Bari	19	31.6	14.0
Cagliari	20	27.9	11.6
Taranto	21	27.1	12.6
Genoa	22	26.2	10.2
Trieste	23	23.3	14.3
Brindisi	24	22.8	13.0

the valley have average values over 35 µg/m^3 PM10. By contrast Taranto, a town in Southern Italy where an important litigation on a steel plant is in course, has an average value of 27, ranking 21st out of 24. The evidence of an increase risk of cancer should imply the adoption of stringent preventive measures, but the problem is to identify and to apply the best strategy in order to reduce pollution sources.

This issue is very difficult to face since, by taking again Turin town as reference, the available data are recent and do apply to a post-industrial situation. In fact, pollution levels in the last years substantially depend upon private and public vehicle traffic, heating systems, weather and the peculiar oro-geographic position common to all Po river plain, whereas industrial emissions are better controlled. The elimination of these sources of pollution is very difficult. Even the efforts over time of the Public Administration to obtain at least a reduction of pollution levels by introducing regulations regarding for instance diesel exhaust from vehicles and domestic heating emissions did not result in an effective improvement (as from the data cited above).

However, a definite indication that the above mentioned sources are the main causes of pollution levels comes from some data for 2013 which show a clear improvement of the PM10 in Turin because of the spontaneous traffic decrease due to the economical crisis and of domestic heating reduction because of favourable weather conditions. In conclusion, further efforts should be made by the Public Administration in order to reduce the cancer risk for the population.

Another aspect to examine is strictly connected with the Italian legislation regarding workplace exposure. In Italy the employer takes by law the responsibility for risk evaluation of carcinogenic agents exposure and is enforced, in order to avoid heavy consequences, to adopt stringent prevention measures including exposure control, medical surveillance, information and training for the workers.

In the case of occurrence of a cancer in an exposed subject, the possible cause is generally discussed in a trial. Thus, the question is: who is responsible for outdoor air pollution control among general population? If regulations are not observed does a responsibility exists at civil and penal levels?

If an analogy would hold with industrial employer responsibility, then the answer would be clear: Public Administration would be responsible for preventive activities and, in case of a disease attributable to outdoor exposure, the legal representatives would face the civil and penal consequences.

Another aspect to consider is that outdoor exposure is ubiquitous, but that remarkable differences are recorded in different areas. Therefore, in population based lung cancer epidemiological studies, this fact is to be taken into account when adjusting for confounding factors, but also plays a role in the liability of individual cancers in civil and penal litigations.

We will consider two different cases, both relating to a lung cancer occurring in two individuals with potential low exposure to an occupational carcinogen, one living in Oulx, a mountain village about 60 Km far from Turin, and the other one living in Turin centre. At the time of 2011 Turin measurements ambient air pollution measurements for Oulx showed a PM10 mean value of 20 μg/m3 with 11 days only in which 50 μg/m3 were exceeded. It is quite obvious that in the forensic litigation the evaluation of cancer origin for the Oulx-dweller requires the attention to be focused, besides occupational exposure, only on smoking habits, whereas in the case of the Turin-dweller 16 hours of exposure to outdoor air pollution should be also added to 8 hours workplace exposure.

The subject at issue is deemed of sufficient relevance to require further discussion and the attention of all those who are involved in the problem.

References

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