

## La medicina del lavoro

Clinica del Lavoro "L. Devo" Via San Barnaba 8, Milano, Italy

Med Lav 1995; 66, 5: 478-481

# MESOTHELIOMAS FOLLOWING EXPOSURE TO ASBESTOS USED IN SUGAR REFINERIES: REPORT OF 12 ITALIAN CASES

C. MALTONI, C. PINTO, D. VALENTI, R. CARNUCCIO, E. AMADUCCI, F. MINARDI

*«Mesoteliomi da esposizione all'amianto usato negli zuccherifici: resoconto di 12 casi italiani».* Vengono riportati 12 casi italiani di mesotelioma (tutti tranne uno del Regione Emilia Romagna), insorti in seguito ad esposizione all'amianto usato negli zuccherifici. Undici casi sono insorti in lavoratori esposti professionalmente, ed uno nel figlio di un lavoratore esposto, in seguito a contatto familiare. Undici dei casi erano pleurici, ed uno peritoneale. Negli 11 casi insorti in seguito ad esposizione lavorativa, tempo medio di latenza è stato di 36,0 anni (da 23 a 48 anni), e l'età media di insorgenza è stata di 63,4 anni. Nel caso insorto in seguito a contatto familiare, il tempo di latenza e l'età di insorgenza sono stati di 37 anni. Si tratta della più ampia casistica di mesoteliomi dovuti all'amianto presente negli zuccherifici riferita finora nella letteratura scientifica. Mentre questi casi dimostrano il rischio di mesoteliomi da amianto negli zuccherifici, non consentono di definire la dimensione degli effetti patologici dell'amianto (e delle fibre minerali artificiali) usato in questa industria. Per valutare l'entità di questo rischio si rendono necessarie ulteriori ricerche.

*Key words:* mesothelioma; asbestos; sugar industry

## INTRODUCTION

The sugar refinery industry has long been widely diffused in Italy, particularly in some regions, and principally in the Emilia Romagna Region, where the production of sugar-beet is largely practised.

European Ramazzini Foundation of Oncology and Environmental Sciences, and Institute of Oncology of Bologna, Bologna (Italy)

This investigation has been performed within the framework of the oncologic epidemiology programme of the Ramazzini Foundation of Oncology and Environmental Sciences and of the Bologna Institute of Oncology, supported by the Bologna Section of the Italian League for the Fight against Cancer

Although in the last years this industry has been gradually declining, on the basis of the available information, in 1993 there were still 29 major sugar refinery plants scattered in 12 of the 20 Italian regions; 11 of which in the Emilia Romagna Region alone.

Asbestos, and more recently glass-wool and rock-wool, have been massively used for the insulation of thermo-hydraulic systems (boilers, pipes, etc.) and for the furnaces of sugar refinery plants. Therefore employees working in the sugar refinery industry, and particularly those engaged in the running and maintenance of therm

## VING USED IN RT OF

F. MINARDI

*verifici: resoconto di 12 casi ma (tutti tranne uno della all'amianto usato negli zuccheri, ed uno nella laire. Undici dei casi erano ad esposizione lavorativa, il uni), e l'età media di insor-ontatto familiare, il tempo di della più ampia casistica di ferita finora nella letteratura esoteliomi da amianto negli ne degli effetti patologici testa industria. Per valutare rehe.*

In the last years this industry ually declining, on the basis e information, in 1993 there major sugar refinery plants 2 of the 20 Italian regions, in the Emilia Romagna Re-

nd more recently glass-wool I, have been massively used ion of thermo-hydraulic sys-pipes, etc.) and for the fur-refinery plants. Therefore rking in the sugar refinery particularly those engaged in nd maintenance of thermo-

hydraulic systems, have been potentially exposed to asbestos for a long time, and to other mineral fibres. The exposure to these fibres, however, is not limited to these workers. More recently, after the closing of several sugar refinery plants, workers engaged in the dismantling of the plants have also been exposed, and probably even more heavily. Moreover, family members of sugar refinery industry workers and people living in areas neighbouring the sugar refinery plants must also be considered potentially exposed to asbestos, as well as to other mineral fibres.

The number of people potentially exposed to asbestos in sugar refineries in Italy is very large. One must consider: the number of workers employed simultaneously in each factory (in many cases hundreds), the long historical period of sugar refinery activity, the particularly high turnover of the working population, the employment of seasonal workers usually engaged for a few months for only one, two or three years, and lately the workers engaged in dismantling. To those people occupationally exposed, one must add the very large number of workers' family members, and the population surrounding the plants, whose exposure has been recently increasing, in relation to the dismantling of the plants.

For Italy, and especially for the Emilia Romagna Region, the exposure to asbestos and mineral fibres used in sugar refinery plants represents a crucial problem of public health, as well as for other countries in the world, where the sugar industry is active and has entailed use of asbestos and other mineral fibres.

The relevance of this problem is at present demonstrated by early reports of mesothelioma cases among people exposed to asbestos in sugar refinery plants.

Given the more recent use of man-made mineral fibres in these workplace, it is too early to expect the onset of neoplastic pathologies related to these fibres.

Between 1983 and 1985, 7 cases of mesothelioma among sugar refinery workers were reported in Sweden, all among people potentially exposed to asbestos (6, 7, 12) (table 1). Since 1991 we have reported several cases of mesothelioma among people of our country, who had been exposed to asbestos used in sugar refinery plants (1-5, 8-11). With this report we are referring the full series of the 12 Italian mesothelioma cases observed to date. To our knowledge, this is at present the largest series of cases of mesotheliomas caused by asbestos in sugar refinery plants reported in the scientific literature.

Table 1 - The 7 mesothelioma cases observed among sugar refinery workers in Sweden (1)

1. The 7 cases were included in the Swedish Cancer-Environmental Registry, which gives information on the economic activity of all cases of cancer in Sweden, notified in 1960-1979
2. The cases were observed in a cohort of 2954 men aged 29-69 years working in sugar refinery plants in 1960
3. All the cases were observed among men, and all were pleural
4. All 7 men were strongly suspected to have been heavily exposed to asbestos:
  - 3 worked full-time with a machine;
  - 1 worked with insulation, who, as was reported, "dug by hand in sacks containing asbestos";
  - 1 was a blacksmith;
  - 1 was a foreman, who, as was reported, "took part in the dismantling of machines which had asbestos as insulation"; and
  - 1 was an unskilled worker, who "was exposed over about two years when he helped to take down a complete factory eight years before he became ill"

(1) From: Steineck (12), 1983

480

MALTONI ET AL

### THE ITALIAN MESOTHELIOMA CASES

All the mesotheliomas herein reported were diagnosed in our Institute. All the diagnoses of cases were based on pathological evidence. These series of cases is not the result of a systematic epidemiological investigation (based on Cancer Registry data or cohort studies), but simply the outcome of observations deriving from our everyday clinical practice. The cases were detected in a period from 1986 to 1995. The data regarding plant location, sex, exposure scenario (job, family situation), site and latency time of the neoplasia, age of the patient at diagnosis and death, and year of diagnosis and death, are given in table 2.

All the reported cases but one, belong to the Emilia Romagna Region. Eleven of the mesotheliomas were pleural, and one peritoneal.

Eleven cases arose among male workers: the job of all these workers entailed exposure to asbestos. Asbestos bodies could be detected in the sputum. One pleural mesothelioma (case 12 of table 2) was found in a 37 year old woman, following familial exposure (figure 1, 2, 3). This woman lived with her father, who, over the whole period from her birth until she reached 31 years of age, worked in two sugar refinery plants, and took his working clothes home. The careful reconstruction of the personal history of this woman excluded any occupational exposure to asbestos.

The average latency period of the 11 occupational cases was 36.0 years (the shortest 23 and the longest 48). It is of interest to note that the latency period of mesothelioma following familial exposure (37.0 years), falls within the average latency period of occupational cases. The

average age of diagnosis of the 11 occupational cases was 63.4 years; the average age at death of the 10 deceased cases was 66.3 years.

### DISCUSSION

The reported cases demonstrate the risk of asbestos diseases (and specifically of mesothelioma) among people exposed to asbestos used in sugar refinery plants, following occupational exposure or through family contact. The risk must be foreseen for all the people exposed in these scenarios in all parts of the world.

The fact that 11 of the 12 cases here reported are located in the Emilia Romagna Region is probably due to two factors: the highest concentration of Italian sugar refinery plants in this region, and the specific scientific interest of our Institution in occupational cancer.

The presented results, while demonstrating the carcinogenic risk of asbestos used in sugar refinery plants, in no way provide the real dimension of the risk. Our series of cases includes, in fact, only anecdotal, clinical observations of mesothelioma. In order to provide, in quantitative terms, the total burden of the problem, one must promote systematic and diligent analytical, epidemiological investigations on defined and representative occupational cohorts and on their family members, dealing with all causes of death, with particular regard to those related to asbestos exposure, and then one must try to collect as much data as possible on the number of workers occupationally exposed to asbestos used in sugar refinery plants, at the national level and world wide.

f diagnosis of the 11 occupa-  
was 63.4 years; the average  
of the 10 deceased cases was

red cases demonstrate the  
tos diseases (and specifically  
ma) among people exposed  
used in sugar refinery plants,  
occupational exposure or  
ly contact. The risk must be  
all the people exposed in  
is in all parts of the world.

hat 11 of the 12 cases here  
located in the Emilia Ro-  
n is probably due to two fac-  
test concentration of Italian  
y plants in this region, and  
scientific interest of our In-  
cupational cancer.

nted results, while demon-  
rcinogenic risk of asbestos  
finery plants, in no way  
al dimension of the risk.  
cases includes, in fact, only  
nical observations of meso-  
order to provide, in quantita-  
ie total burden of the prob-  
ist promote systematic and  
tical, epidemiological investi-  
fined and representative oc-  
shorts and on their family  
ding with all causes of death,  
ir regard to those related to  
sure, and then one must try  
much data as possible on the  
workers occupationally ex-  
estos used in sugar refinery  
a national level and world

## ASBESTOS EXPOSURE IN SUGAR REFINERIES

481

Table 2 - The 12 mesothelioma cases observed among people exposed to asbestos used in sugar re-  
finery plants in Italy

| Cases<br>No. (1)                         | Initials | Site of sugar<br>refinery plant                                                     | Sex | Exposure scenario<br>(job, degree of<br>relationship)                                              | Site of the<br>neoplasia | Latency<br>time (2)<br>(years) | Age at<br>diagnosis | Year of<br>diagnosis | Age at<br>death | Year of<br>death |
|------------------------------------------|----------|-------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------|--------------------------|--------------------------------|---------------------|----------------------|-----------------|------------------|
| I. Cases following occupational exposure |          |                                                                                     |     |                                                                                                    |                          |                                |                     |                      |                 |                  |
| 1                                        | LS       | Crevalcore<br>(Bologna)                                                             | M   | Worker engaged<br>in the running<br>of centrifuges and<br>in the maintenance<br>of refinery plants | Pleura                   | 29                             | 61                  | 1986                 | 62              | 1987             |
| 2                                        | TL       | Codigoro<br>(Ferrara)                                                               | M   | Various jobs<br>(seasonal)                                                                         | Pleura                   | 31                             | 49                  | 1986                 | 49              | 1986             |
| 3                                        | FG       | Bondeno<br>(Ferrara)                                                                | M   | Various jobs<br>(his main place of<br>work was under a<br>boiler) (seasonal)                       | Pleura                   | 28                             | 44                  | 1989                 | 49              | 1994             |
| 4                                        | BD       | Molinella<br>(Bologna)                                                              | M   | Pipefitter                                                                                         | Pleura                   | 41                             | 65                  | 1991                 | 66              | 1992             |
| 5                                        | GB       | Bondeno<br>(Ferrara)                                                                | M   | Pipefitter                                                                                         | Pleura                   | 34                             | 54                  | 1991                 | 56              | 1993             |
| 6                                        | DU       | Classe<br>(Ravenna)                                                                 | M   | Maintenance worker<br>Pipefitter<br>Responsible for<br>thermic system                              | Pleura                   | 41                             | 62                  | 1992                 | 63              | 1993             |
| 7                                        | CG       | Molinella<br>(Bologna)                                                              | M   | Painter<br>Engaged in the<br>heating of sugar-<br>beet sauce                                       | Pleura                   | 43                             | 78                  | 1993                 | 78              | 1993             |
| 8                                        | BA       | Crevalcore<br>(Bologna)                                                             | M   | Mason engaged<br>in the maintenance<br>and repair of furnaces                                      | Pleura                   | 37                             | 77                  | 1993                 | 78              | 1994             |
| 9                                        | RF       | Molinella<br>(Bologna)                                                              | M   | Porter                                                                                             | Peritoneum               | 41                             | 80                  | 1994                 | 80              | 1994             |
| 10                                       | MA       | Bologna                                                                             | M   | Responsible for<br>thermic system                                                                  | Pleura                   | 48                             | 82                  | 1994                 | 82              | 1994             |
| 11                                       | GA       | Montecosaro<br>Scalo<br>(Macerata)                                                  | M   | Boiler operator<br>(seasonal)                                                                      | Pleura                   | 23                             | 45                  | 1995                 |                 | Living           |
| Mean                                     |          |                                                                                     |     |                                                                                                    |                          | 36.0                           | 63.4                |                      | 66.3 (3)        |                  |
| II. Case following familial exposure     |          |                                                                                     |     |                                                                                                    |                          |                                |                     |                      |                 |                  |
| 12                                       | NF       | Working places<br>of father: Miran-<br>dola (Modena)<br>and Crevalcore<br>(Bologna) | F   | Daughter                                                                                           | Pleura                   | 37                             | 37                  | 1988                 | 43              | 1995             |

(1) According to year of diagnosis

(2) Period of time elapsed between the start of the exposure and the onset of the first symptoms  
and signs of the neoplasia

(3) Referred to the 10 cases already deceased

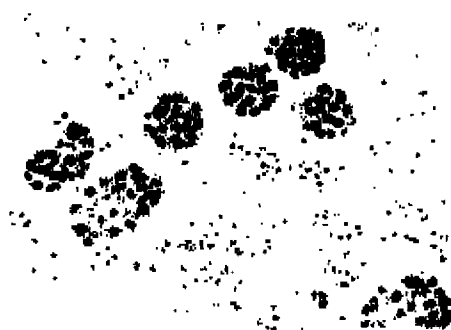


Figure 1 - Pleural mesothelioma in the daughter of a sugar refinery plant worker, following asbestos exposure by family contact. Mesothelioma cells in pleural effusion. Pap. x 320



Figure 2 - Pleural mesothelioma in the daughter of a sugar refinery plant worker, following asbestos exposure by family contact. Mesothelioma cells in pleural effusion. H.E. x 1280



Figure 3 - Pleural mesothelioma in the daughter of a sugar refinery plant worker, following asbestos exposure by family contact. Pleural biopsy: epitheliomorphic mesothelioma. H.E. x 320

In the meanwhile, prevention measures must be undertaken in the sugar refinery industry, both in normal working conditions, and also in the course of dismantling, with reference not only to asbestos but also to other mineral fibres. Moreover, medical surveillance should be performed on exposed workers who are still active and also on those who have retired.

## SUMMARY

Twelve Italian cases of mesothelioma (all the cases but one from the Emilia Romagna Region), following exposure to asbestos used in sugar refinery plants, are reported. Eleven cases arose in workers occupationally exposed, and one in the daughter of an exposed worker, following family contact. Eleven of the cases were pleural and one peritoneal. In the 11 cases following occupational exposure the average latency time was 36.0 (range 23-48) years, and the average age at onset was 63.4 years. In the case which followed family contact, the latency time and the age of the onset were 37 years. This represents the largest series of cases of mesothelioma due to the asbestos present in sugar refinery plants reported to date in the scientific literature. While these cases demonstrate the risk of asbestos mesothelioma in the sugar refinery industry, they in no way give the dimension of the pathological effects of asbestos (and man-made mineral fibres) used in this industry. To assess this risk further research is suggested.

## REFERENCES

1. MALTONI C, FINI A, PINTO C, e coll: Mesothelioma pleurico da asbesto in figlia di operaio di zuccherifici dell'Emilia Romagna. *Acta Oncol* 1994; 15: 149-154

nwhile, prevention measures taken in the sugar refinery in normal working conditions in the course of dismantlement not only to asbestos but mineral fibres. Moreover, surveillance should be performed on workers who are still active and those who have retired.

Italian cases of mesothelioma (but one from the Emilia Romagna), following exposure to asbestos in sugar refinery plants, are reported: 11 cases arose in workers occupationally exposed, and one in the family of an exposed worker, following occupational exposure. Eleven of the cases were peritoneal. In the 11 cases of occupational exposure the average age at onset was 36.0 (range 23-48) years. This represents the case which followed family exposure. This represents the average age at onset was 37 years. This represents the case which followed family exposure. This represents the case which followed family exposure. While these cases demonstrate asbestos mesothelioma in the sugar industry, they in no way diminish the pathological effects of asbestos in the sugar industry. To assess this further research is suggested.

S

FINI A, PINTO C, e coll: Mesothelioma da asbesto in figlia di lavoratore di zuccherifici dell'Emilia Romagna. *Acta Oncol* 1994; 15: 149-154

2. MALTONI C, PINTO C, SINIBALDI C, e coll: Settimo caso di mesotelioma da asbesto fra lavoratori di zuccherifici, nella casistica dell'Istituto di Oncologia di Bologna. *Acta Oncol* 1994; 15: 149-154
3. MALTONI C, PINTO C, LODI P, e coll: Tre nuovi casi di mesotelioma pleurico tra operai addetti alla installazione, manutenzione e demolizione di impianti idraulici e termoidraulici (terzo, quarto e quinto caso dalla casistica dell'Istituto di Oncologia di Bologna). *Acta Oncol* 1992; 13: 195-215
4. MALTONI C, PINTO C, SINIBALDI C, e coll: Casistica dell'Istituto di Oncologia di Bologna: quarto caso di mesotelioma pleurico in operaio di zuccherificio esposto ad asbesto. *Acta Oncol* 1992; 13: 817-830
5. MALTONI C, PINTO C, VALENTI D, e coll: Sesto caso di mesotelioma pleurico da asbesto fra lavoratori di zuccherifici nella casistica di mesoteliomi dell'Istituto di Oncologia di Bologna. *Acta Oncol* 1993; 14: 311-316
6. MALKER HR, MALKER BK, BLOT WJ: Mesothelioma among sugar refinery workers. *Lancet* 1983; 2: 858
7. MALKER HR, Mc LAUGHLIN JK, MALKER BK, et al: Occupational risks for pleural mesothelioma in Sweden, 1961-79. *J Natl Cancer Inst* 1985; 74: 61-66
8. PINTO C, SINIBALDI C, LATTES C, e coll: Mesotelioma pleurico in lavoratore di zuccherificio esposto ad asbesto (quinto caso di mesotelioma pleurico fra lavoratori di zuccherifici nella casistica dell'Istituto di Oncologia di Bologna). *Acta Oncol* 1993; 14: 89-100
9. PINTO C, VALENTI D, MALTONI C: Mesotelioma pleurico in operaio di zuccherificio esposto ad asbesto (e a lana di roccia). *Acta Oncol* 1992; 13: 425-433
10. PINTO C, VALENTI D, SINIBALDI C, e coll: Ottavo, nono e decimo caso di mesotelioma da asbesto tra lavoratori di zuccherifici dell'Emilia Romagna. *Acta Oncol* 1994; 15: 355-369
11. SINIBALDI C, LODI P, RONCONI L, e coll: Mesotelioma pleurico da asbesto in operaio addetto all'installazione e alla manutenzione dell'impianto termoidraulico di uno zuccherificio. *Acta Oncol* 1991; 12: 569-576
12. STEINECK G, CARSTENSEN J, WIKLUND K, EKLUND G: Mesothelioma among sugar refinery workers. *Lancet* 1983; 2: 1503