


## CASE STUDY

# Pleural mesothelioma in a circus worker

Carolina Mensi<sup>1</sup>  | Carolina Zellino<sup>1</sup> | Marco Polonioli<sup>2</sup> | Barbara Dallari<sup>1</sup> |  
 Angela Cecilia Pesatori<sup>1,3</sup> | Luciano Riboldi<sup>1</sup> | Dario Consonni<sup>1</sup>

<sup>1</sup>Occupational Health Unit, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy

<sup>2</sup>Post Graduation School of Occupational Medicine, Università degli Studi di Milano, Milan, Italy

<sup>3</sup>Department of Clinical Sciences and Community Health, Università degli Studi di Milano, Milan, Italy

**Correspondence**

Carolina Mensi, Clinica del Lavoro, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, via San Barnaba, 8; 20122 Milan, Italy.  
 Email: carolina.mensi@unimi.it

**Funding information**

This work was partially supported by: Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro (INAIL), Rome, Italy; BRiC P55 and P59; Fondazione Regionale per la Ricerca Biomedica 'An integrated precision medicine approach to malignant mesothelioma: from mutation load to epidemiology and therapy' (acronym: PRIMATE-code ARL\_2/2018).

**Abstract**

**Objectives:** To describe an unusual occupational asbestos exposure in a patient with mesothelioma.

**Methods:** Since 2000, the Lombardy Mesothelioma Registry (LMR) collects cases of malignant mesothelioma (MM) occurring among people residing in the Lombardy Region, North-West Italy, with a population of 10 million inhabitants. For each case, clinical records and asbestos exposure are collected. Each case is then classified in agreement with the guidelines of the National Mesothelioma Registry.

**Results:** We identified a male (86 years old), former smoker, who had been working for 53 years as a circus truck driver and tamer of lions and tigers. The first circumstance of exposure was the use of an asbestos tape that wrapped around the hoop in the feline jumping show with a flaming hoop. The second one was the presence of insulating panels protecting the engine placed inside the trucks.

**Conclusion:** A new MM case with an occupational etiology has been found in the public entertainment, an occupational sector not usually considered at risk for the presence of asbestos.

**KEYWORDS**

asbestos, circus, mesothelioma, occupational exposure, public entertainment

## 1 | INTRODUCTION

Until 1992, when asbestos was banned, Italy was an asbestos-producing country and one of the major consumers of the 20th century in Europe. Asbestos exposure was used in a wide range of working environments, for example, mining and marketing of asbestos, asbestos cement production, shipyards, and asbestos textile industries.<sup>1</sup> The wide use of asbestos in 1950-1980 led to a high incidence of asbestos-related diseases such as malignant mesothelioma (MM), with a latency period of more than

40 years on average. In Italy, since 2002, epidemiological surveillance of MM is compulsory through a dedicated population-based registry (Registro Nazionale Mesoteliomi – ReNaM). Thanks to this systematic collection, a great number of unusual occupational asbestos exposure circumstances were discovered in non-asbestos textile workers,<sup>2,3</sup> in furniture makers,<sup>4</sup> jewellers and goldsmiths,<sup>4,5</sup> upholsterers,<sup>4</sup> bakers,<sup>4</sup> winemakers and barmen,<sup>4</sup> school teachers,<sup>4-6</sup> hairdressers,<sup>7</sup> and barbers.<sup>4</sup> Occupational exposures also concern agricultural workers,<sup>4,8</sup> dental laboratory technicians,<sup>9</sup> and doll manufacturers.<sup>10</sup>

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Journal of Occupational Health* published by John Wiley & Sons Australia, Ltd on behalf of The Japan Society for Occupational Health

Furthermore in 2010, Mensi *et al*<sup>11</sup> described three cases of MM and one case of asbestos-related pleural disease among entertainment workers, especially in workers in theatres and cinemas. In theatres the presence of asbestos in curtains, covers, and firefighter's personal protective equipment (overalls and gloves) was described; moreover, the raw mineral was used in scenery to reproduce snow, sand, dust, and webs. In cinemas, asbestos had been sprayed on the ceiling to reduce the noise in civil buildings.<sup>11</sup> Bianchi *et al*<sup>12</sup> reported asbestos exposure in a projectionist affected with MM. Recently, in Italy, many entertainment buildings have been renovated, finding large amounts of asbestos (particularly chrysotile and crocidolite) used in friable form at concentrations up to 85%-100%<sup>11</sup> for fireproofing and soundproofing purpose. Finally, Stopponi<sup>13</sup> reports a peculiar circumstance of asbestos use in a circus juggler. The show consisted of twirling wooden clubs linked with flammable material. Asbestos was used in the manufacture of a white fireproof rope that linked the clubs to each other. The preparation of the rope was done by the juggler himself three times a month.

In this paper, we describe a further case of pleural MM with occupational exposure to asbestos in public entertainment. To our knowledge, this is the first reported case among circus workers.

## 2 | CASE REPORT

Since 2000, the Lombardy Mesothelioma Registry (LMR) collects all incident cases of MM diagnosed in residents of the region (10 million of inhabitants). Although compulsory by law, MM reporting to LMR is far from complete. Therefore, the interaction with the regional departments of pathology, pulmonology, surgery, oncology, and the periodic linkage to databases of departments of pathology, hospital discharge records, mortality and the compensation for occupational disease from Italian Working Compensation Authority (INAIL) is instrumental to ensure a high completeness of MM recording. The Registry, besides collecting the clinical records and ascertaining diagnosis, investigates the complete occupational history, lifestyle habits, home related activities, and family history through the administration of a standardized questionnaire to the patient or to the next-of-kin. Based on imaging and clinical and pathological information, confirmed MM are classified as 'definite, probable, or possible', while asbestos exposure is classified as 'occupational (definite, probable, possible), familial, domestic or environmental (indoor or outdoor)' following standardized criteria.<sup>8</sup>

A patient with MM was reported to the Registry in 2017. He was born in 1931. His clinical history showed benign prostatic hyperplasia and arterial hypertension; he smoked 5-6 filter cigarettes per day from 1951 to 1970.

In January 2017, at the age of 86, he developed worsening dyspnea. A chest CT scan showed a right pleural effusion and

contrast-enhancing thickening affecting the ipsilateral parietal and diaphragmatic pleurae.

In February 2017, right video-assisted thoracoscopy confirmed the presence of a significant amount of hemorrhagic pleural fluid and diffuse nodular pleural thickening; the aspirated fluid was positive for malignant tumor cells. Cytological analysis, suspected for mesothelioma, found blood material with atypical mesotheliomorphous cells. Immunohistochemical analysis showed calretinin (+), Ber-Ep4 (-), CK7 (+), CK20 (-), HMB 45 (-). Histological examination of pleural specimens showed a mesothelioma with sarcomatoid and desmoplastic aspects, immunoreactivity for CK7, weak positivity for calretinin and occasional immunoreactive cells for Ber-Ep4. In May 2017 the patient died, surviving just 3 months.

When interviewed, the patient reported that he had worked from 1947 to 2000 (53 years) in the circus as a handyman and tamer of tigers and lions. He was in charge of multiple tasks: assembling/disassembling the different components of the circus (caravan and menageries) and their transportation and loading/unloading train wagons using trucks that had the engine block in the driver's cab. In addition, he performed the task of tamer of wild animals in jumping felines through fire hoops; an asbestos tape was used to wrap around the hoop during these performances. The asbestos tape was manually replaced by the worker both before each show and during animal training tests (daily); the removed tape was damaged and crumbled in the hands of the worker. The subject continued with his shows until 2000, but stopped the use of asbestos tape in 1990. Duration of exposure was a few hours daily for 43 years; latency (time since first exposure) was several decades.

Another possible source of exposure may have resulted from the presence of insulating panels protecting the engine placed inside the trucks he drove. In the transport sector, a case of asbestosis has been reported in a truck driver exposed to asbestos fibers inside the driver's cab.<sup>14,15</sup> Some inspections highlighted, in truck models produced from 1949 to 1980, the presence of an asbestos rope wrapped around the exhaust manifold at the base or side of the engine block placed inside the driver's cab itself. Unfortunately, the circus worker was not able to report the truck models he drove, so asbestos exposure from this source remained uncertain.

No extra-professional exposure, either environmental or familial, was reported.

## 3 | CONCLUSION

In this paper, we reported the first case of mesothelioma in a circus worker with direct exposure to asbestos used as lining of the fiery hoops through which the animals jumped.

This case has been defined as an occupational MM and medical-legal procedures have been started. The Italian

Working Compensation Authority did not recognize any compensation due to the subject's lack of insurance protection.

We believe the description of this case report is important, because it emphasizes the importance of unusual uses of asbestos and the need to conduct a thorough examination of occupational history.

## ACKNOWLEDGMENTS

The authors thank Mrs Franca Bertolotti of the Occupational Prevention and Safety Departments of the Local Health Units (SPSAL-ATS Milano Metropolitana) for her collaboration in interviewing patient; the personnel of the regional hospital Medical, Surgical, and Pathology Departments for their collaboration in providing clinical documentation; Luana Garlati, Lombardy Mesothelioma Registry, for her valuable secretarial assistance.

## CONFLICTS OF INTEREST

CM and DC served the court as consultants for the court in litigations concerning asbestos-related diseases.

## AUTHOR CONTRIBUTIONS

CM: conceived the idea; CM, CZ, and MP drafted the manuscript; CM, BD, MP, CZ, and LR evaluated the mesothelioma case in agreement with National Mesothelioma Registry Guideline; ACP and DC critically revised the manuscript. All authors contributed to the interpretation of findings and discussion. All authors revised and approved the manuscript for intellectual content.

## ETHICAL STATEMENTS

Malignant mesothelioma reporting to registry is compulsory by law (277/1991 and 81/2008), therefore ethics approval is not required.

## DATA AVAILABILITY STATEMENT

Research data are not shared.

## ORCID

Carolina Mensi  <https://orcid.org/0000-0002-9075-3684>

## REFERENCES

- Marsili D, Angelini A, Bruno C, et al. Asbestos ban in Italy: a major milestone, not the final cut. *Int J Environ Res Public Health*. 2017;14:1379.
- Mensi C, Macchione M, Termine L, et al. Asbestos exposure in the non-asbestos textile industry: the experience of the Lombardy Mesothelioma Registry. *Epidemiol Prev*. 2007;31(4 Suppl 1):27-30. In Italian.
- Angelini A, Chellini E, Parducci D, Pucetti Puccetti M, Mauro L. Reconstruction of the asbestos exposure in a textile company producing sewing threads through the use of an unusual information source. *Med Lav*. 2020;111(2):126-132. In Italian.
- Binazzi A, Scarselli A, Corfiati M, et al. Epidemiologic surveillance of mesothelioma for the prevention of asbestos exposure also in non-traditional settings. *Epidemiol Prev*. 2013;37(1):35-42. In Italian.
- Placidi D, Porru S, Alessio L. A report of 3 cases of pleural mesothelioma with unusual asbestos exposure. *Med Lav*. 1999;90(5):671-680. In Italian.
- Barbieri PG, Somigliana A, Girelli R, Lombardi S, Sarnico M, Silvestri S. Pleural mesothelioma in a school teacher: asbestos exposure due to DAS paste. *Med Lav*. 2016;107(2):141-147. In Italian.
- Carugno M, Mensi C, Sieno C, Consonni D, Riboldi L. Asbestos exposure among hairdressers. *Med Lav*. 2012;103(1):70-71.
- Mensi C, Dallari B, Polonioli M, Riboldi L, Consonni D, Pesatori AC. Mesothelioma in agriculture in Lombardy, Italy: an unrecognized risk. *Int J Environ Res Public Health*. 2021;18:358-366.
- Mensi C, Ciullo F, Barbieri GP, et al. Pleural malignant mesothelioma in dental laboratory technicians: a case series. *Am J Ind Med*. 2017;60:443-448.
- Barbieri PG, Somigliana AB, Lombardi S, Festa R, Girelli R, Sarnico M. Pleural mesothelioma in doll manufacture: possible asbestos exposure. *Med Lav*. 2017;108(2):111-117. In Italian.
- Mensi C, Garberi A, Bordini L, Sieno C, Riboldi L. Asbestos-related diseases in entertainment workers. *Med Lav*. 2010;101(6):416-418.
- Bianchi C, Bianchi T, Tommasi M. Mesothelioma of the pleura in the Province of Trieste. *Med Lav*. 2007;98:374-380. In Italian.
- Stopponi RA. "Particular" case of exposure to asbestos in the circus profession. *Med Lav*. 2007;98:345. In Italian.
- Costellati L, Guglielmin AM, Calisti R, Sgarzi A, Ghelli C. Dispersion of asbestos fibers and artificial mineral fibers (MMMF) inside truck cabs: a possible exposure of truck drivers. *Med Lav*. 1991;82(6):510-514. In Italian.
- Calisti R, Sgarzi A, Ardisson S, Bernardi P, Di Federico E, De Ruggero N. Asbestosis in a truck driver: a clinical case and analysis of the exposure. *Med Lav*. 1991;82(1):30-37. In Italian.

**How to cite this article:** Mensi C, Zellino C, Polonioli M, et al. Pleural mesothelioma in a circus worker. *J Occup Health*. 2021;63:e12250. <https://doi.org/10.1002/1348-9585.12250>