

## COMMENTARY

## Prevention of disease caused by fluoro-edenite fibrous amphibole: the way forward

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## Abstract

Few months after the publication of the monographic section of *Annali dell'Istituto Superiore di Sanità* second issue of 2014 "Health impact of fibres with fluoro-edenitic composition", the carcinogenicity of fluoro-edenite was assessed by the International Agency for Research on Cancer (IARC) in the frame of Monograph 111. The IARC Working Group concluded that there is sufficient evidence in humans that exposure to fluoro-edenite fibrous amphibole causes mesothelioma, and sufficient evidence of carcinogenicity in experimental animals. Fluoro-edenite was allocated to Group 1 (the agent is carcinogenic to humans). Now, in view of the recent IARC evaluation, preventive action in Biancavilla requires an upgrade. First of all, environmental monitoring has to be further implemented. All operations of house cleaning should be performed employing wet tools, in order to avoid dust-raising. It is very important that environmental and biological monitoring be related to epidemiological surveillance. The recently approved act of the Sicilian Government concerning a plan of health interventions in Biancavilla will favour cooperation between national, regional and local health institutions with the common goal of improving the quality and appropriateness of diagnostic and therapeutics procedures offered by the health services.

## Key words

- fluoro-edenite
- mesothelioma
- asbestiform fibre exposure
- environmental clean-up

Few months after the publication of the monographic section of *Annali dell'Istituto Superiore di Sanità* second issue of 2014 "Health impact of fibres with fluoro-edenitic composition" [1-5], the carcinogenicity of fluoro-edenite was assessed by the International Agency for Research on Cancer (IARC) in the frame of Monograph 111. The conclusions reached by IARC Monographs Working Group, published online in the October 31, 2014, issue of *Lancet Oncology* [6], can be summarized as follows. The excess of mesothelioma incidence and mortality observed in the municipality of Biancavilla (as compared to Sicilian Region mortality and incidence rates) was large and stable, similar in men and women and most prominent in young adults. Most of the cases had no history of occupational exposure to asbestos. These findings suggest an environmental, rather than occupational cause, that was identified in the fluoro-edenite fibrous amphibole present in the soil of Biancavilla, including a quarry whose products were extensively used in the local building industry and for road paving. Intraperitoneal and intrapleural injection of fibrous fluoro-edenite in-

duced mesothelioma in male and female rats. The results of mechanistic studies were consistent with the proposed mechanisms of fibre carcinogenesis. The Working Group concluded that there is sufficient evidence in humans that exposure to fluoro-edenite fibrous amphibole causes mesothelioma, and sufficient evidence of carcinogenicity in experimental animals. Fluoro-edenite was allocated to Group 1 (the agent is carcinogenic to humans).

As extensively discussed in the previously quoted monographic section of *Annali*, the adoption of preventive action in Biancavilla had been recommended by ISS since 1998 in the frame of a precautionary approach, soon after the initial observation of the mesothelioma cluster and the detection of the fibre in the soil, building materials, quarry byproducts and in the lung of a patient deceased for pleural mesothelioma. Since 2002, furthermore, Biancavilla was recognized as site of national interest for environmental clean-up. Major interventions such as termination of the quarry's activity, covering of the quarry area with spritz bitumen, asphalt paving of roads where quarry byproducts had been previously applied,

and removal of construction industry byproducts in the newest districts of the town were successfully implemented. In the last decade, airborne levels of fluoro-edenite fibres showed a significant decrease, as documented by Bruni *et al.* [3].

Now, in view of the recent IARC evaluation, preventive action in Biancavilla requires an upgrade.

First of all, environmental monitoring has to be further implemented, with the specific aim of detecting and mapping previously unrecognized potential sources of fibres, e.g. in residual rocky areas or fields within the urbanized sector of Biancavilla territory. If relevant sources of fibres were detected, they should be object of specific clean-up procedures with appropriate techniques. In the meanwhile, also agricultural areas should be monitored, in order to detect locations where fibres are present in top-soil. Farmers should then be trained in order to be able to manage contaminated soil by use of good practices expressly designed for the agricultural setting.

Assessment of indoor exposure to fluoro-edenite fibres is a complex issue and no regulatory frame exists. Some recommendations aimed at reducing exposure levels can anyhow be provided. All operations of house cleaning should be performed employing wet tools, in order to avoid dust-raising. Major interventions in terms of building maintenance or demolition should adopt approaches such as those recommended in front of the presence of asbestos-containing materials. A census of dwellings built in the time-window of operation of the quarry should be implemented, in order to monitor them with respect to possible fibre release and to adequately plan maintenance work, if requested.

Environmental monitoring should be integrated by biomonitoring, since preliminary studies have reported a significant burden of fluoro-edenite fibres both in sputum of bronchitic subjects and in sheep lung samples [7, 8]. Due to the elevated biopersistence of fluoro-edenite fibres, measuring the occurrence of fibres in biological matrices may provide valuable information on the distribution of risk in the community.

It is very important that environmental and biological monitoring be related to epidemiological surveillance, a set of activities aimed at estimating the occurrence of fluoro-edenite related disease in Biancavilla. Besides monitoring the epidemic curve of mesothelioma, epidemiological surveillance may contribute to the detection of high-risk population subgroups, *i.e.* those characterized by particular environmental or occupational exposure levels. Epidemiological surveillance, in this context, should not only investigate mesothelioma risk, but also provide estimates of the prevalence of pneumoconiosis and pleural plaques in the community. While the latter have never been systematically investigated, a significant excess of hospitalization due to pneumoconiosis was recently reported [9].

As far as lung cancer risk is concerned, conflicting findings are present in the literature. Several papers reported non-significant excesses of lung cancer mortality, incidence and hospitalization in Biancavilla women (but not in men) if compared to Sicilian Region expected figures [10, 11, 4]. Cernigliaro *et al.* [9] reported a significant excess of lung cancer mortality in Biancavilla women us-

ing the neighbouring rural municipalities as reference population. This specific issue should be addressed in the frame of a properly designed case-control study.

In the meanwhile, the possibility of a carcinogenic action of fluoro-edenite with respect to the lung should be sufficient to trigger a well-designed antismoking campaign specifically aimed at young people, in order to contrast the possible synergy between cigarette smoke and fluoro-edenite fibres.

The recently approved act of the Sicilian Government concerning a plan of health interventions in Biancavilla will favour cooperation between national, regional and local health institutions with the common goal of improving the quality and appropriateness of diagnostic and therapeutics procedures offered by the health services.

As it has been discussed in the present paper, the public health policy so far designed and implemented in the Biancavilla area has been initially inspired by the precautionary principle, and subsequently driven by a fully preventive approach in light of the ascertained carcinogenicity of fluoro-edenite.

Many difficulties have been met in this process, because the pursuit of health prevention in contaminated sites is not yet clearly defined and organized neither in Italy nor in Europe at large [12]. Italy though, is certainly playing a leading role in this domain, as witnessed by the recently started COST Action "Industrially Contaminated Sites and Health Network (ICSHNet)" whose coordination has been assigned to ISS ([www.cost.eu/COST\\_Actions](http://www.cost.eu/COST_Actions)).

In any case, notwithstanding these limitations, the Italian and Sicilian Authorities are actively engaged in fostering environmental clean-up and health prevention in Biancavilla.

The task is made complex not only by the problems that have been previously mentioned, but also by a specific question. The European and Italian regulations on contaminated sites have been initially created in the context of former industrial sites or in areas characterized by uncontrolled dumping of hazardous wastes.

In Biancavilla, the problem is represented by a naturally occurring contaminant, whose presence in the soil depends on remote geological and volcanological events, and more recently by anthropic interventions, namely quarrying activity and use of contaminated materials in building industry and road paving. The occurrence of the fibre in the environment may have not yet been fully explored, which may have determined limitations to clean-up activities.

At the same time, Biancavilla community, with its 24 000 inhabitants has the right to plan its development in terms of urban setting, agricultural practices, transportation policies and recreational activities.

Public health and especially children health protection must of course be promoted as a priority, and this might imply some limitations to the other afore-mentioned development goals.

The search of the best solution in all these instances will require communication, participatory action, transparency and above all democracy.

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