Detecting potential risk for human exposure to asbestos using wild rats as sentinels

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INTRODUCTION & AIM

Asbestos has been used in the past in many fields, being broadly appreciated for its resistance to fire and heat and its average tensile strenght. However its link to chronic pulmonary related diseases (asbestosis, malignant mesothelioma and lung cancer) is now well-known.

In Casale Monferrato (CM) city, the biggest Italian plant of Eternit® (a mixture of cement-asbestos) was active from 1907 to 1986 and, although banned since 1992 in Italy, sources of exposure may still exist in the environment, due to asbestos *in-situ* or past disposal of asbestos-containing waste.

The lung fiber burden in sentinel animals may be useful to identify undetected sources of absestos exposure as shown in a recent study showing the feasibility of its determination in wild rats, a suitable sentinel species never used before for environmental lung asbestos fiber burden studies (Ardizzone *et al.*, 2014).

Now, we are conducting a field study to identify areas within CM where the human exposure to absestos is likely to be high based on the detection of lung fibers in sentinel wild rats.

MATERIALS AND METHODS

Stepwise strategy:

- Definition of a geographical sampling grid (figure1); CM has been divided in 61 cells (200x200m) where capturing wild rats.
- Neighbours with different degree of priority have been identified, based on the technological processes and absestos transport, historically reported within the city;
- Capture of a minimum of 5 wild rats per grid cell (figure2) with a multi-capture device (Ekomille®) AND transport to the laboratory;
- Preliminary necropsy and PCR investigation aimed at excluding any zoonosis;
- Lung tissue sampling and histological investigation;
- Scanning electron microscopy with energy dispersive spectrometry (SEM–EDS) investigation after pooling of 5 rodent lungs.

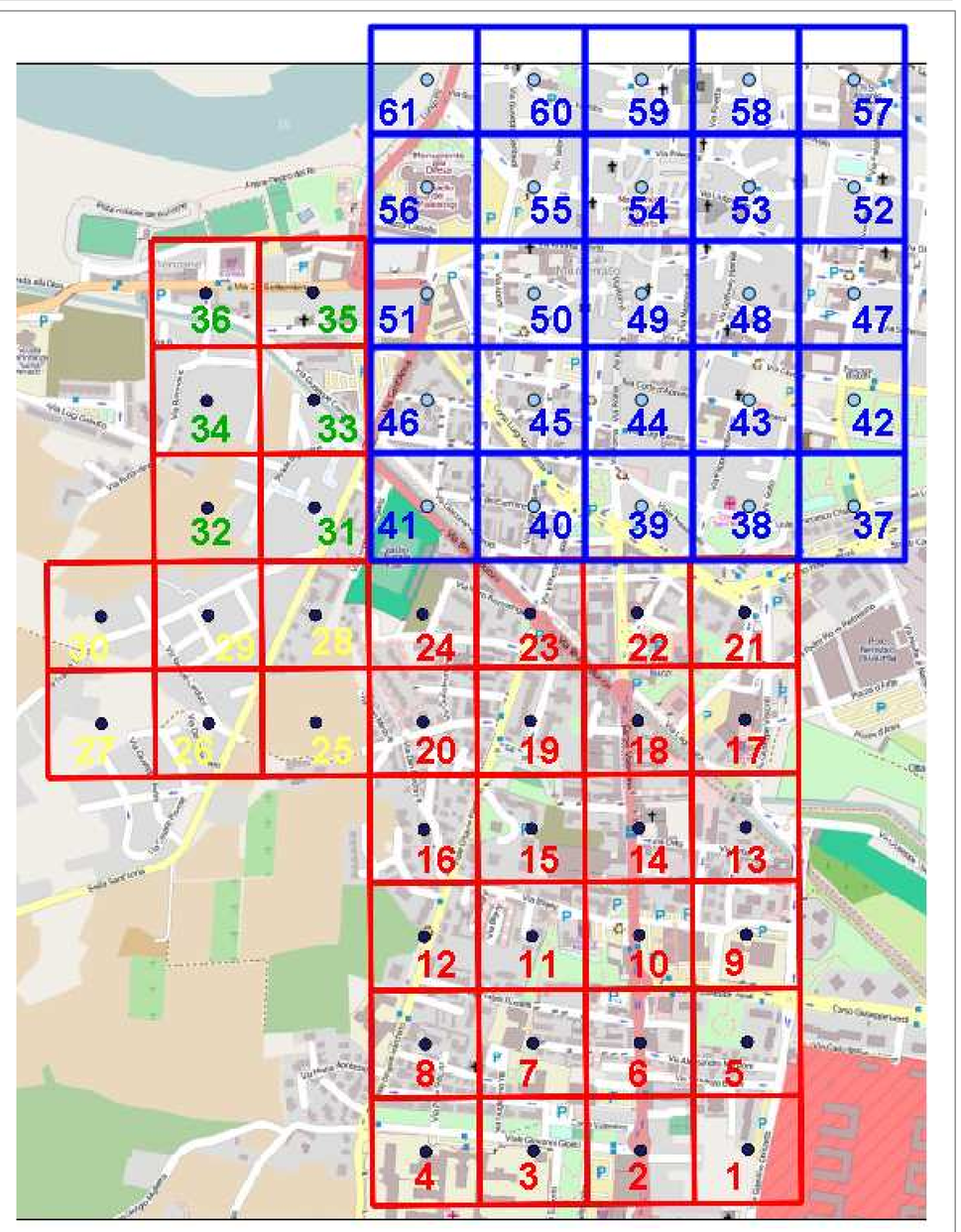

Figure1. Sampling grid: cells are organized in 4 areas: respectevely, red, yellow, green and blue areas were defined with decreasing priority.

PRELIMINARY RESULTS AND DISCUSSION

Up to date, 18 wild rats have been captured in 5 different cells (#12, #18, #49, #54, #59), but only in cell #54 five rats. i. e. the completed pool, have been collected. The SEM-EDS investigation of the pool showed:

- 35700 fibers per gram of dry weight (ff/gdw) absestos tremolite (length>5*μm*; width<3*μm*);
- 5100 ff/gdw asbestos tremolite (length<5*μm*; width<3*μm*);
- 5100 ff/gdw di absestos grunerite (length>5*μm*; width<3*μm*).

Despite the small sample size, these results allow us to be confident about the identification of an "hot spot" of latent sources of absestos in CM city using rats as sentinels.

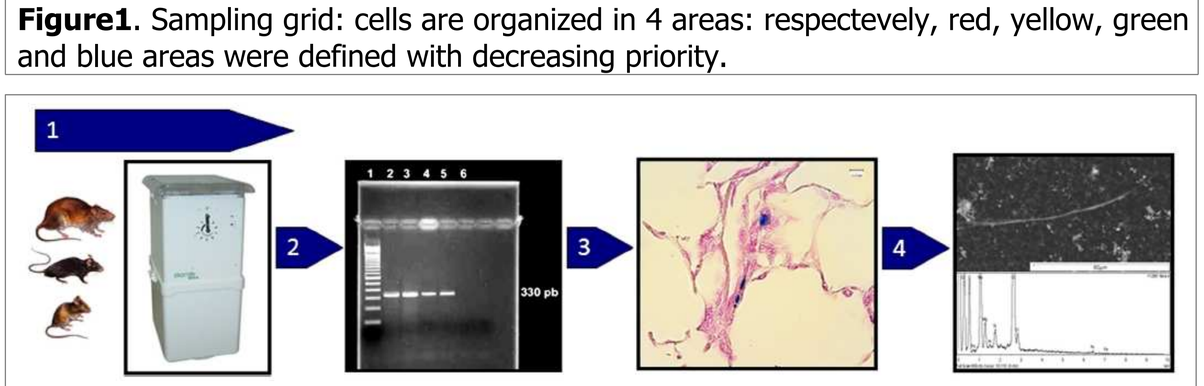

Figure2: flow chart: 1) rodent capture and transport; 2) necropsy and PCR investigation; 3) histological investigation; 4) SEM-EDS investigation on rodent pools

Reference: Ardizzone *et al.* The wild rat as sentinel animal in the environmental risk assessment of asbestos pollution: A pilot studySci Total Environ. 2014 Feb 13;479-480C:31-38

This study was founded by Italian Ministry of Health grant IZSPLV 12/11RC

SVEPM conference, Dublin 26th-28thMarch 2014