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## Exposure to respirable crystalline silica (and feldspars) in equine riding arenas: non-conventional exposure scenario

**Elena Belluso**<sup>3</sup>, Silvana Capella<sup>1</sup>, Donata Bellis<sup>2</sup>, Michela Bullone<sup>4</sup>, Giulia Costa<sup>5</sup>, and Francesco Di Benedetto<sup>6</sup>

<sup>1</sup>University of Torino, Department of Earth Sciences, and Interdepartmental Centre for Studies on Asbestos and other Toxic Particulates "Giovanni Scansetti", Torino, Italy ([silvana.capella@unito.it](mailto:silvana.capella@unito.it))

<sup>2</sup>University of Torino, Interdepartmental Centre for Studies on Asbestos and other Toxic Particulates "Giovanni Scansetti", Torino, Italy ([donata.bellis@libero.it](mailto:donata.bellis@libero.it))

<sup>3</sup>University of Torino, Interdepartmental Centre for Studies on Asbestos and other Toxic Particulates "Giovanni Scansetti", Torino, and Institute of Geosciences and Earth Resources, CNR, Unit of Torino, Italy ([elena.belluso@unito.it](mailto:elena.belluso@unito.it))

<sup>4</sup>University of Torino, Department of Veterinary Sciences, Grugliasco, and Interdepartmental Centre for Studies on Asbestos and other Toxic Particulates "Giovanni Scansetti", Torino, Italy ([michela.bullone@unito.it](mailto:michela.bullone@unito.it))

<sup>5</sup>University of Torino, Department of Earth Sciences, Torino, Italy ([giulia.costa185@edu.unito.it](mailto:giulia.costa185@edu.unito.it))

<sup>6</sup>University of Ferrara, Department of Physics and Earth Sciences, Ferrara, Italy ([francesco.dibenedetto@unife.it](mailto:francesco.dibenedetto@unife.it))

Footing surfaces regularly used in equine riding arenas are composed by mixture of several naturally occurring rocks (specifically sand, silt, and clay), many times with the addition of specific additives (e.g., organic or synthetic fibres, wood, rubber, etc.). The most common and abundant minerals composing the used rocks are quartz, and feldspars; micas, clay minerals, oxides and others may be also present. The mineral composition of the arenas differs depending on the supply quarry, but it also changes in the same arena over time.

During riding and training activities, arena surfaces are strongly trampled by the horse's hooves, resulting in production of fine and airborne dusts including also respirable crystalline silica (RCS) particles. Horses, equestrian workers, and people frequenting the riding schools for recreational reasons are therefore potentially exposed to respiration of RCS.

Some studies have dealt with the correlation between the horse's exposure to RCS and consequent bone problems [1]. So far, four cases of lung cancers related with RCS exposures in horse trainers have also been recognized [2].

There are not systematic studies on the characterization of different inorganic particles inhaled by horses, and their possible respiratory consequence (besides silicosis). Little is known about health injuries for humans, both equestrian workers and people frequenting riding arenas.

The aim of this study is to detect what kinds and amount of inorganic particles can be inhaled by horses, distinguishing among RCS species and others, both to evaluate the possible health consequences in this recreative and professional context.

Samples of bronchoalveolar lavage fluid (BALF) of 10 horses have been collected and investigated by SEM/EDS, and TEM/EDS techniques.

The quality and quantity of inhaled inorganic particles present in healthy equine BALF samples were compared with those found in equine BALF samples with chronic inflammatory (asthma-like) lung diseases.

The present study provides a way to characterize the exposure of horses to RCS. This study could highlight the problem relating to a potential increased exposure risk for RCS, which could lead to the development of occupational lung cancer within the workers in this sector.

The results of this study suggest the need of both further medical assessments and studies to promote awareness within the sector of the exposure risks associated with footing materials used in equestrian arenas and the impact of increased knowledge and understanding of the risks involved.

As strategies for health hazard control, i.e. the air concentration reduction of RCS and other inorganic particles, may be the regular arena watering.

In this dynamical context, the horses can be used as sentinel for the human health by a periodic control of the BALF inorganic particles burden.

[1] Zavodovskaya, R.; Stover, S.M.; Murphy, B.G.; Katzman, S.; Durbin-Johnson, B.; Britton, M.; Finno, C.J. Bone formation transcripts dominate the differential gene expression profile in an equine osteoporotic condition associated with pulmonary silicosis. *PLoS ONE* (2018) 13, e0197459.

[2] Kim, H.R., Kim B, Jo BS, Lee JW Silica exposure and work-relatedness evaluation for occupational cancer in Korea. *Annals of Occupational and Environmental Medicine* (2018) 30:4