Histopathological Analysis of Lung Tissue Features in Rodents Exposed in Areas with Naturally Occurring Asbestos

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Introduction

In this work, we explore the histopathological analysis of lung tissue from rodents collected around Boulder City where actinolite was found. Actinolite is an amphibole asbestos that can cause asbestos-related diseases such as pulmonary fibrosis and inflammation when it is inhaled. Our goal is to determine if exposure to actinolite has been sufficient enough to cause disease in mammals. The presence of relatively high levels of actinolite collected around Boulder City suggests that people living in the same area could be experiencing ongoing exposure to asbestos fibers and negative health effects. Studies of the effects of environmental hazards on wild animals can assess health risks in humans and provide early warning for public health interventions. We first collected 10 animal subjects around Boulder City then examined the rodents to determine if the presence of actinolite has caused pulmonary fibrosis. Then, different methods of tissue processing were compared to determine which method yields a good slide. Techniques were then developed in histological preparation of lung tissues.

Methods and Histopathologic Evaluation

We collected four *Dipodomys merriami*, four *Cheatodipus* and two *Pogonomyrnus*. Histological preparations included fixation, dehydration, clearing, embedding, sectioning at 5 μm, and staining. Masson’s trichrome stain was used to distinguish collagen fibers or fibrosis from lung tissue. Toluidine Blue stain was used to identify mast cells because increased number of mast cells have been observed in lungs of fibrotic human patients. Asbestos bodies were detected using Perls’ staining.

Fibrous Actinolite in Southern Nevada

![Figure 1. Fibrous actinolite amphiboles were found in the sampling locations that are shown as white circles on the map.](image)

Figure 2. Histology of the lung: No sign of pulmonary fibrosis (Masson’s trichrome stain).

Figure 4. Histology of the lung: Asbestos bodies in alveolar walls (Perls’ staining).

Figure 5. Histology of the lung: Accumulation of degranulated mast cells in alveolar walls and spaces (Toluidine Blue stain).

Conclusions

Our results show that 1 out of 10 animal subjects showed evidence of fibrosis, 5 out of 10 animal subjects have asbestos bodies trapped in their lung tissue, and 5 out of 10 animal subjects have elevated levels of mast cells. In the future, we will be taking further specimens to confirm our results.

References


Acknowledgement

Work supported by National Science Foundation-Experimental Program to Stimulate Competitive Research Undergraduate Research Opportunity Program (NSF-EPSCoR-UROP), UNLV Office of Undergraduate Research’s Summer Undergraduate Research Funding (OUR SURF), and AANAPISI Summer Research Institute (SRI).