62. In Vitro Toxicity of Silica Substitutes Used for Abrasive Blasting

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Sandblasting with silica sand is associated with an increased risk of acute silicosis (silicolipoproteinosis), a debilitating lung disease with high mortality and morbidity. This increased mortality and morbidity from sandblasting operations continue to occur even when respiratory protection is used. Because of this increased risk for mortality and morbidity, there has been a growing trend to discourage or ban the use of silica sand in sand blasting operations. However, abrasive blasting is an important step in cleaning and preparing surfaces for painting and other industrial uses. As a result of increased demand, a variety of substitutes for silica sand are finding commercial use in abrasive blasting even though their safety has not been clearly established. These substitutes include coal, smelter slags, crushed glass, steel grit, and mineral compounds such as olivine, staurolite, garnet, aluminum oxide and specular hematite. The goal of this study was to compare *in vitro* the toxicity of selected substitutes (treated sand, garnet, specular hematite, staurolite and coal slag) to that of silica sand. Each particle type was tested within two hours after blasting (fresh) and four weeks after blasting (aged). The blasting process changed several trace metal contents of all blasted particles collected from ambient air. Blasting with all the abrasives resulted in higher airborne concentrations of iron. Both fresh and aged particles decreased rat alveolar macrophage viability and increased macrophage enzyme release to varying degrees. Some blasted particles also generated hydroxyl radicals and caused lipid peroxidation in cell-free systems. This study demonstrates that silica sand blasting substitutes are not without biological effects. In some instances their toxic potential exceeds that of sand. This would indicate that the abrasive substitutes may have biological effects in vivo. This preliminary investigation justifies the continued study of these substitutes as potential toxicants. An important consideration in the future studies should be focusing on the materials collected during blasting, rather than the pre-blast materials, since the blasting process itself affects the composition of the blasted particles.

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