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Introduction

South Africa is the largest producer of platinum in the world. Platinum is found in the Bushveld Complex, a volcanic intrusion containing many other minerals, including pyrrhotite, chalcopyrite, pentlandite, chromite, gold, copper, nickel, sulphur, arsenic, selenium, tellurium, iron, tin, cobalt, zinc, titaniferous magnetite, vanadium pentoxide, and crystalline silica (Figure 1). Despite working in such mineral complex environments, very little research has been conducted (Table 1) and little is known about platinum miners' health risks.

Objective

To explore the possibility of platinum mine workers developing silicosis.

Methodology

Under the Occupational Diseases in Mines and Works Act, all deceased miners and ex-miners are eligible for autopsy examination of their cardio-respiratory organs for diagnosis of compensable disease.

The autopsy records of all platinum mine workers with silicotic nodules in the lungs and/or regional lymph glands were reviewed. Evidence of silica dust exposure, such as employment in the gold mining industry, was sought from a number of additional data sources, including the Medical Bureau for Occupational Diseases, The Employment Bureau of Africa, the Mine Workers Compensation database, company records, and friends and relatives, and these cases were excluded.

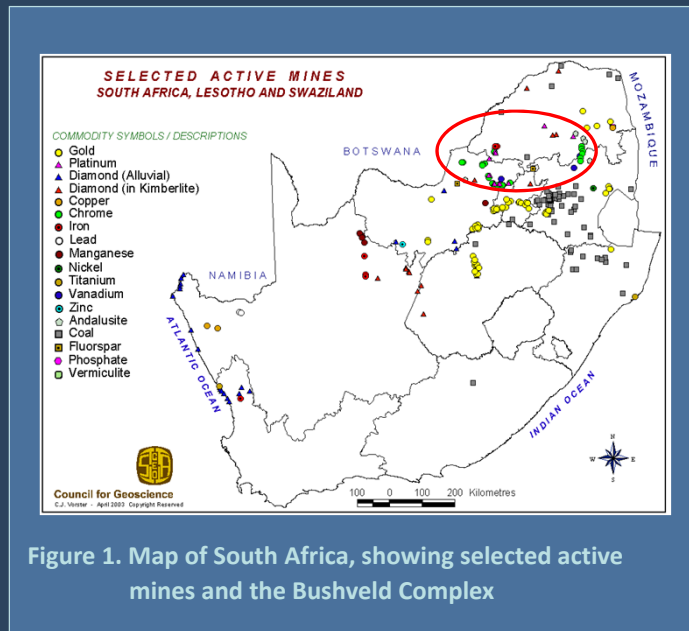


Figure 1. Map of South Africa, showing selected active mines and the Bushveld Complex

Table 1. Previous studies in South African platinum mines

Authors	Measurements	Pt mines	Gold mines
Biffi and Belle, 2003	silica content of stope rock (2 mines) 7 respirable dust samples (2 mines)	0.45% < 0.2%,	9.9% and 39.1% 4.5 to 57%
Dekker, Franz and Ndlovu, 2007	113 respirable dust samples (1 mine)	0.018 - 0.035 mg/m ³	NA
Girdler-Brown <i>et al.</i> , 2006	Silicosis on X-ray	3/969	NA

South African OEL = 0.1 mg/m³ ACGIH limit = 0.025 mg/m³



Figure 2. Photograph of mine worker drilling for platinum underground

Results

From 1975 to 2009, 12 241 men on the autopsy database had worked in the platinum mining industry: 6 490 (53.0%) had no record of having worked in another commodity. 60% had been employed for more than one year of whom 2% (85) had silicosis at autopsy and 13% (490) had fibrotic nodules in the lymph nodes.

After reviewing all the data sources, there were 5 mine workers with pulmonary silicosis and an additional 25 with fibrotic nodules who started work before the age of 25 and with no evidence of exposure to silica dust outside the platinum mining industry.

Conclusion

This study supports the suggestion that there is a risk of silicosis in platinum mine workers:

- silica is present in platinum-bearing rock
- respirable silica is present in the ambient air
- there are cases of silicosis in platinum mine workers

Recommendations

Platinum mines should measure silica dust levels routinely.
All cases of silicosis should be actively investigated.

References

- Biffi M and Belle BK (2003). Quantification of dust-generating sources in gold and platinum mines. GAP 802. Johannesburg: Mine Health and Safety Council.
Dekker JJ, Franz RM and Ndlovu N (2007). Project on the status (baselining) of silica dust and noise exposure 1). SIM 06-06-01. Johannesburg: Mine Health and Safety Council.
Girdler-Brown B, Murray J, Wichmann J, Robinson F, Nelson G, Downs K (2006). Respiratory disease in South African platinum mining industry. SIM 03-08-06. Johannesburg: Mine Health and Safety Council.