

# Noise and vibration in the South African mining industry

Jl Phillips<sup>1</sup>,  
G Nelson<sup>2</sup>,  
MH Ross<sup>1,2</sup>

<sup>1</sup>National Institute for Occupational Health, National Health Laboratory Service, Johannesburg,  
<sup>2</sup>School of Public Health, University of the Witwatersrand, Johannesburg

Corresponding author:  
Dr Jl Phillips,  
National Institute for Occupational Health,  
PO Box 4788,  
Johannesburg, 2000  
e-mail: jim.phillips@nioh.nhls.ac.za  
Web site:  
www.nioh.ac.za

## INTRODUCTION

Excessive noise, resulting in noise induced hearing loss (NIHL) is a global occupational health problem.<sup>1</sup> In the mining industry throughout the world, the adverse health effects of exposure to noise and vibration are a serious problem.<sup>2,3</sup> Noise induced hearing loss (NIHL) in the South African mining industry was documented in the medical literature in 1987.<sup>4</sup> It remains a problem and, in 2004, 5629 cases of NIHL were each paid, on average, R13 117 by the South African Compensation Commissioner (A Begley, personal communication). Hand-arm vibration syndrome (HAVS), caused by excessive exposure to hand-held vibrating tools, has recently been described in gold miners.<sup>5</sup> Due to its recognition in other countries, HAVS was included as a compensable disease in the Compensation for Occupational Injuries and Diseases (COID) Act.<sup>6</sup>

A project, funded by the Mine Health and Safety Council (MHSC) and coordinated by the National Institute for Occupational Health, was undertaken to tackle the problem. The aim was to effect a technology transfer to the mining industry to help build awareness of the effects of noise and vibration by consolidating

existing knowledge, acquiring new knowledge, and developing best practices to prevent adverse health effects.<sup>7</sup> Prior to the commencement of the project, focus groups selected components of noise and vibration for investigation; these are summarised below.

The final products of the project are a booklet on noise and vibration control<sup>8</sup> and a CD comprising the results of each component of the project, as well as information, legislation and best practice relevant to noise and vibration. Links to other national and international websites are also provided. An electronic version of the booklet is included in this issue on the Noise and Vibration Information Resources CD. Both the booklet and the CD provide useful information for all industries. The CD was designed and published by Dr David W. Stanton, Chamber of Mines of South Africa. A copy of the CD has been included in this issue of Occupational Health Southern Africa. As stated, the practical guide to noise and vibration control in the South African mining industry is also available as a booklet. Any requests for the CD or the booklet should be directed to Dr Jl Phillips.

## 1. Hearing conservation programmes (HCPs)

The project included a guide to best practice for the implementation and management of mine HCPs, in terms of effectiveness and practicability, and it provides the requirements for individual elements of a HCP, as well as for their review and evaluation. Current HCPs were also evaluated and a second comprehensive document, with recommendations for improving the effectiveness of HCPs, was produced.

## 2. Hand Arm Vibration Syndrome (HAVS)

HAVS has been described in cross-sectional studies from several countries<sup>5, 9-11</sup> but little is known about the dose-response or progression of the disease. HAVS was found to have progressed in gold miners over a four-year period. The prevalence of signs and symptoms of HAVS was lower in a warm gold mine than in a cooler gold mine. No correlation with noise-induced hearing loss was found. Several screening tools for



HAVS were tested. A questionnaire was developed and found to be the most useful tool; it can be used in all industries where HAVS has the potential to occur.

### **3. Comparison of noise and vibration emissions of rock drills**

For the first time, rock drill manufacturers came together to compare the noise and vibration measurements of their drills. The noise and vibration levels produced by the four rock drills were higher than those recommended by international legislation.<sup>12</sup>

### **4. Anti-vibration gloves**

A literature survey was conducted to investigate the

that the advice and information provided on the CD will be useful to all occupational health practitioners, as well as to engineers, mine ventilation offices and other management staff of all industries.

### **ACKNOWLEDGEMENTS**

We thank those who participated in the project for their valuable contributions: Mike Franz, Stephan Heyns, Danie Burger, Belinda Dias, Elsjebe Sampson, Schu Schutte, Johann Kielblock, Wikus van Niekerk, John Hassall and David W. Stanton. Thanks also go to the Mine Health and Safety Council for providing funding (<http://www.simrac.co.za>).

*“The prevalence of signs and symptoms of HAVS was lower in a warm gold mine than in a cooler gold mine.”*

potential use of anti-vibration gloves to reduce hand-arm vibration exposure. Anti-vibration gloves that are currently commercially available are unlikely to prevent HAVS in the South African mining industry.

### **5. Whole body vibration (WBV)**

A review of the English language literature showed that WBV can have a number of consequences, including motion sickness, visual and speech impairment lower back pain, osteoarthritis of the hip, sciatic pain, gastrointestinal disturbances and dizziness. In females, effects on the urogenital tract, including menstrual disorders and spontaneous abortion have been reported. Practical advice to reduce WBV is provided in the report.

### **6. A practical engineering guide for noise and vibration control in the mining industry**

This illustrated guide<sup>8</sup> provides an explanation of the general principles of sound and vibration, as well as practical suggestions for reducing noise and vibration levels in the workplace. The principles outlined in the guide are applicable to all industries.

### **CONCLUSION**

The full report of each component of the project described in this paper is on the CD. The best practices described in these reports are applicable to workplaces beyond the confines of the mining industry. It is hoped

### **REFERENCES**

1. Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M. The global burden of occupational noise-induced hearing loss. *Am J Ind Med*. 2005;48(6):446-58.
2. Donoghue AM. Occupational health hazards in mining: an overview. *Occup Med (Lond)*. 2004;54(5):283-9.
3. McBride DI. Noise-induced hearing loss and hearing conservation in mining. *Occup Med (Lond)*. 2004;54(5):290-6.
4. Hessel PA, Sluis-Cremer GK. Hearing loss in white South African goldminers. *S Afr Med J*. 1987;71(6):364-7.
5. Nyantumbu B, Barber CM, Ross M, Curran AD, Fishwick D, Dias B, Kgalamono S, Phillips JI. Hand-arm vibration syndrome in South African gold miners. *Occup Med (Lond)*. 2006 Aug 23; [Epub ahead of print] PMID: 16928782 [PubMed - as supplied by publisher].
6. Compensation for Occupational Injuries and Diseases Act 130 of 1993. Government Printer: Pretoria, 1993.
7. Phillips JI, Nelson G. Health 806: Best practices in preventing adverse effects of noise and vibration: an integrated technology transfer programme of project outcomes and deliverables pertaining to noise and vibration. Mine Health and Safety Council: Johannesburg, 2006.
8. van Niekerk JL, Hassall JR. A practical guide to noise and vibration control in the South African mining industry. Johannesburg: Mine Health and Safety Council, 2005. ISBN 1-919853-16-2.
9. Futatsuka M, Shono M, Sakakibara H, Quoc Quan P. Hand arm vibration syndrome among quarry workers in Vietnam. *J Occup Health*. 2005;47(2):165-70.
10. Bovenzi M, Franzinelli A, Strambi F. Prevalence of vibration-induced white finger and assessment of vibration exposure among travertine workers in Italy. *Int Arch Occup Environ Health*. 1988;61(1-2):25-34.
11. Dasgupta AK, Harrison J. Effects of vibration on the hand-arm system of miners in India. *Occup Med (Lond)*. 1996;46(1):71-8.
12. Directive 2002/44/EC of the European Parliament and of the Council on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration) (sixteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC), 2002.