

Acute effect of organic solvents and noise on the efferent reflex in workers

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ABSTRACT

Noise in the workplace is responsible for hundreds of cases of occupational deafness every year in France, with dramatic consequences on the quality of life of those affected, and represents a very high financial cost for society. Noise is not the only danger to hearing, as chemicals can also have an ototoxic effect. The most common in the workplace are the aromatic solvents whose ototoxicity has been well characterized by experimental studies in animals and epidemiological studies in humans. It should be noted that solvents are often present in noisy work environments, the risk of co-exposure is therefore also important.

We have previously shown in animals that most of these solvents also exert a pharmacological action on the brain resulting in a decrease in the threshold for triggering the efferent reflex (ER). The objective of the present study was to determine whether (1) this effect on the ER threshold exists in humans, (2) whether it is measurable, and (3) whether its measurement makes the discrimination of the effects of noise from those of solvents possible.

Auditory measurements were performed with EchoScan and tonal audiometry on workers exposed to ototoxic solvents with or without exposure to noise. Workers were measured before and just after their working day. They were coachbuilders, painters, workers in composite material production workshops or anatomopathologists in the hospital sector, etc... Noise and solvent exposures were determined in parallel for each of these workers.

The results show that the exposure to solvents below occupational exposure limits effectively decreases the ER threshold, while exposure to noise increases it. Logically, in case of co-exposure, these two opposite effects cancel each other, and the ER threshold variation approaches zero. Conversely, pure tone audiometry is only sensitive to noise-induced hearing fatigue and does not discriminate between these two types of nuisances.

These data suggest that the ER threshold measured by EchoScan is a non-invasive functional biomarker that could be used by occupational health services to perform a field analysis of hearing risks related to physical (noise) and chemical (solvents) nuisances.

Keywords : Noise, efferent reflex, occupational, solvents, auditory fatigue, ototoxic.