

## Hearing Loss Induced for Pesticides in a Rural Worker: A Case Report

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### Abstract

The use of pesticides by agricultural workers without protection can damage the hearing. This report describes the characteristics of work with pesticides, and compares the results of high-frequency audiometry over 36 months.

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## Introduction

The World Health Organization reported that 23% of global deaths are due to modifiable environmental factors in that use of pesticides are included<sup>1</sup>. Work in agriculture poses risks to rural workers when they are routinely exposed to pesticides.

The occupational hearing loss has been mostly only attributed to noise although there are other agents that might contribute to its potentiation, among them pesticides<sup>2-10</sup>. Studies have linked exposure to otoaggressives agents, noise and ototoxics, at higher frequencies above 8kHz, before the others<sup>11-13</sup>.

Studies reported harmful effects of pesticides to peripheral and central auditory pathways and in which the organophosphates can also be responsible for neurotoxicity to the auditory system<sup>2,3,5,6,7,10</sup>.

In this report, will be presented a rural worker case exposed to pesticides. High-frequency audiometry was measured and the results were compared over a period of 36 months.

## Case History

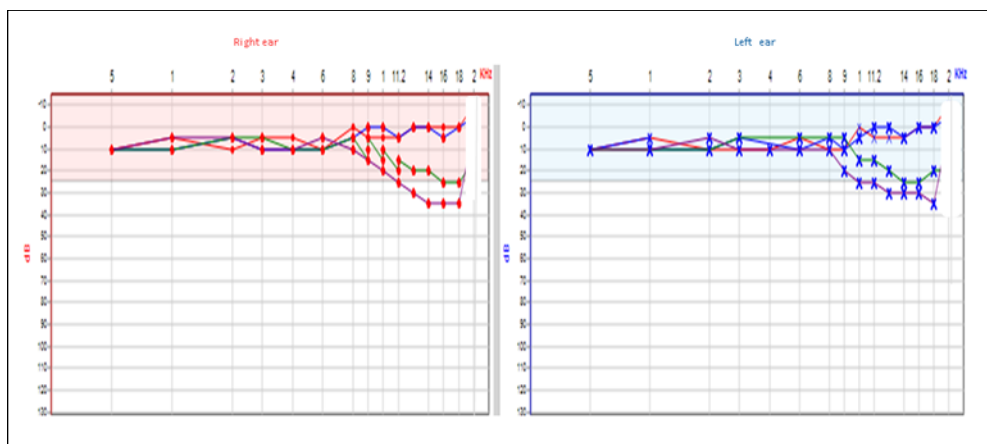
A 25-year-old family worker male reported regular and concurrent exposure to insecticides

There was no report of previous otologic or metabolic disease, use of ototoxic medication, surgery or head trauma, social exposure to intense noise, use of alcohol, tobacco or drugs regularly. All ear canal inspection, distortion product otoacoustic emissions (DPOAE), pure tone audiometry at 0.5K, 1K, 2K, 3K, 4K, 6K and 8KHz, were normal. All tympanometry tests were Jerger's Type "A" and acoustics reflex threshold were presents during 36 months.

Pure-tone air audiometry was done with the frequencies of 0,5K, 1K, 2K, 3K, 4K, 6K and 8KHz and high-frequency audiometry at 9K, 10K, 11K, 12.5K, 14K, 16K, 18K and 20KHz, in ambient acording requirements of ISO 8253-1.

The high-frequency audiometry was performed at four different moments: baseline, after 12, 24 and after 36 months. The results of initial tests and in the first year was normal, ie, conventional audiometry was close to normal and high-frequency audiometry revealed similar configuration.

In the course of months, the rural worker showed no health change worthy of note or otologic complications. He was subjected to the same tests during the period. The results were normal in both ears, except in high-frequency audiometry in which it was



**Figure 1:** Hearing tests over the months with worse results on high-frequencies

organophosphates, herbicide glyphosate, spraying weekly during four years. No individual protection equipment was identified.

observed worsening in thresholds 11K, 12.5K, 14K, 16K, 18K and 20KHz in the 24<sup>th</sup> and 36<sup>th</sup> month (Fig. 1).

## Discussion

The World Health Organization linked more than 8 million of non-communicable diseases in world to the environment in which is included the agricultural work with pesticides<sup>1</sup>. These products lead to unintentional poisonings at home and in the workplace, they are estimated to cause thousand deaths annually with the major part being from preventable chemical exposures<sup>14</sup>.

The pesticides in agriculture can volatilize and suspend into the air when sprayed and are hazardous to human health and to the environment. In Brazil, for each dollar spent on pesticides, approximately US\$ 1.28 may be spent on health care and sick leave due to occupational poisoning<sup>15</sup> and the number of cases was increasing in the Northeast<sup>16</sup>.

Neurological diseases, cancer and others health problems have been associated with exposure to pesticides. Pesticides are neurotoxic agents that may cause hearing loss. The European Union recommends since 2003 that prevention programs also operate in the monitoring of workers exposed to chemical agents, but the work activities in rural areas usually occur as family production on small farms with no access for occupational safety standards<sup>17</sup>.

Individual susceptibility to pesticides cannot be measured, but due to the use of pesticides weekly we believe there may be relationship to hearing loss presented.

The hearing damages caused by ototoxicity are recognized and the use of high-frequency audiometry endorse the importance of this tool in the evaluation and monitoring of hearing loss<sup>13,18-20</sup>.

The invariable result in DPOAE in the case surveyed is in line with authors who found no significant difference between DPOAE and biomarkers in students exposed to pesticides<sup>7</sup>. It is believed that, similarly to

the conventional audiometry, the frequency for DPOAE range did not suffer damage from ototoxic agents, in few years, as noted.

In addition, over the years in this case report all tympanometry tests, acoustics reflex threshold and DPOAE were normal, but HFA was not. Aging has not interfered in the findings because the worker was younger and had no history of exposure to noisy environments, ototoxic drugs or metabolic diseases that could be cause hearing loss at high frequencies found.

In the case investigated, we observed that only high-frequency audiometry had change, which reinforces the theory that pesticides may have ototoxic effects. The effect of toxic agents may cause hearing loss<sup>17</sup> and pesticides could be considered as ototoxic agents from the results shown.

In middle or low-income countries, there are no specialized health procedures in rural areas, thus the population access to audiological tests is difficult<sup>1</sup>. In this context, the inclusion of the HFA on occupational exams could be of great value to the workers exposed to pesticides.

High-frequency audiometry was an important audiological test for early identification of auditory alterations and in the auditory follow-up of subjects exposed to chemicals and also pesticides.

## Conclusions

The exposure to pesticides of different toxicities from the rural worker investigated was the only one harmful event to auditory system that may be associated with hearing loss found in the high frequencies.

It is noteworthy that the lack of obligation, prescribed by law, for the hearing monitoring of workers exposed to chemical agents, requires a critical positioning of researchers, health professionals and work-safety organs to contribute positively to change this scenario.

Removing pesticides from agricultural practice and reducing access to them would prevent many diseases and also ototoxic hearing loss. Agroecological practices in agriculture can be sustainable alternatives to minimize the use of pesticides, and actions of health and safety at work should be encouraged by the rulers.

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