Hearing Loss - Occupational Health and Safety: A Rural Perspective

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The Problem

Since the introduction of Nurse Audiometry Services in the Community Health Program in the 1980s, it has been the belief of a number of audiometrists and others working in rural communities, that farmers, members of farming families and farm workers appeared to have a reasonably high incidence of hearing loss. Along with this growing awareness of the problem, came the realisation that this group of people, due to the nature of their work, were unlikely to present at Community Health Centres for hearing screening, education and support. It became apparent that if we, as health professionals, were to determine the extent of the problem, we needed to be offering a service in locations where farmers, their families and rural workers would congregate.

In 1985, nurse audiometrists in the New England region, in conjunction with the Moree Agricultural Health Unit, began providing hearing screenings for farmers at agricultural field days. Initially, a brief history was obtained, hearing levels at 1, 2, 3, 4, 6 and 8K were screened using an audiometer, with results explained to the farmer/worker and, if possible, his/her family. Information regarding the prevention of further hearing loss, assistive listening devices and hearing/listening tactics were made available.

Results obtained in the early stages of the program (see Figure 1) indicated around 61-66% of farming community members (including graziers) had a significant Noise Induced Hearing Loss (NIHL), a loss resulting from exposure to harmful noise levels represented typically by a deterioration in hearing thresholds from 3K to 4K, with improvement evidenced at 6K and 8K, in one or both ears. Frequently, the loss in the left ear is greater than that of the right ear.

Figure 1: Hearing screening outcomes for farmers, farming family members & farm workers, AgQuip 1985

![Percentage of hearing screening outcomes](image-url)
NIHL among farmers was not confined to the New England region. Results from centres outside the region were similar. Concurrently, with further development of the Agricultural Health Unit based at Moree Hospital, this knowledge resulted in an extension of the screening service to include other field days in the New England region and various parts of NSW.

Figure 2 indicates the prevalence of NIHL in males screened to be 73.3%, even higher than the level of 61-66% indicated during the first screenings in 1985.

Figure 2: Hearing screening outcomes for farmers, farming family members and farm workers, March 1985 - July 1986

Development of a detailed questionnaire regarding the length and nature of actual noise exposure and protection methods utilised, improved screening facilities, coupled with intensive staff training led to a greater standardisation of data collected and improvements in data quality, exposing a previous underestimation of the significance of the problem.

Preliminary examination of 1992 results indicates that closer to 82% have a hearing loss which is consistent with exposure to excessive levels of noise over time. Figure 3 provides a breakdown of the hearing status by age group.

To date, few similar reports are available. Plakke and Dare (1992) in a recent study in Iowa (USA) found that 10% of 30 year old farmers, 30% of 40 year old farmers and 50% of 50 year old farmers had a hearing handicap which could be attributed to excessive farm noise exposure. From their evidence the trend is established in the third decade. Refer Appendix I for a graphical representation of the New England experience to support these American findings.

Unlike many other industries, farming involves a diversity of tasks. A considerable proportion of these activities produce noise, either steady state (continuous) or impulse noise, which, at certain levels and for various periods of time, is considered hazardous to hearing skills, potentially placing the farmer at risk of permanent loss. A list of common farm noise sources with estimated typical noise levels can be found below.

Table 1: Typical farm noise levels (approx.) and recommended maximum exposure times, based on 85dB(A) over an eight-hour period

<table>
<thead>
<tr>
<th>Noise source</th>
<th>Typ. noise level</th>
<th>Rec. max. exp. time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor working with a cabin</td>
<td>83dB(A)</td>
<td>8 hours</td>
</tr>
<tr>
<td>Tractor working without a cabin</td>
<td>97dB(A)</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Grain auger</td>
<td>91dB(A)</td>
<td>2 hours</td>
</tr>
<tr>
<td>Header</td>
<td>94dB(A)</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Angle grinder</td>
<td>95dB(A)</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Pig shed (at feed time)</td>
<td>103dB(A)</td>
<td>7 minutes</td>
</tr>
<tr>
<td>Chainsaw (cutting)</td>
<td>110dB(A)</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Shotgun (at ear of shooter)</td>
<td>140dB(A)</td>
<td>Nil (instant damage)</td>
</tr>
</tbody>
</table>

Source: NSW FarmSafe Committee pamphlet, 'Don't let farm noise destroy your hearing.'
Farms are classified as industries and as such, come under the various State Occupational Health and Safety Acts for noise control. In larger cities and rural towns, industries are surveyed for excessive noise areas with recommendations made for noise reduction. Inspections are carried out at intervals. To undertake similar surveys and inspections nationally in the farming industry, would require considerable resource utilisation. Farmers themselves have been given the responsibility to ensure their environments are safe places of employment.

Table 2. Comparison of legislated maximum noise levels allowed by State/Territory over an eight-hour period

<table>
<thead>
<tr>
<th>State</th>
<th>Max. noise levels allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>90dB(A)</td>
</tr>
<tr>
<td>Victoria</td>
<td>85dB(A)</td>
</tr>
<tr>
<td>Queensland</td>
<td>90dB(A)</td>
</tr>
<tr>
<td>Western Australia</td>
<td>90dB(A)</td>
</tr>
<tr>
<td>South Australia</td>
<td>90dB(A)</td>
</tr>
<tr>
<td>Tasmania</td>
<td>90dB(A)</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>85dB(A)</td>
</tr>
</tbody>
</table>

It is envisaged all states will eventually come under one national standard of 85dB(A). With noise levels measured in decibels using a logarithmic scale, each increase of 3dB doubles the intensity of the noise dose received, subsequently reducing the recommended exposure by half the length of time. Using Victoria as an example, with the maximum set at 85dB(A), the time before hearing is damaged is 8 hours, at 88dB(A) the time is 4 hours, at 91dB(A) the time is 2 hours, at 94dB(A) the time is 1 hour, at 97dB(A) the time is reduced to 30 minutes, and so on.

The best method of reducing the risk of permanent hearing loss is to reduce the noise at its source. Rural enterprises are not conducive to successfully achieving this across all tasks and activities. Alternatively, the use of personal hearing protection assists in reducing the risk of long term hearing loss. From Table 3, utilisation patterns vary across tasks performed. Of concern is the high incidence of occasions for which no protection is being worn.
The incidence of tinnitus (continuous or intermittent sounds/noises/beeps/whistles/pulsations for example, experienced in the ear/ears) is frequently associated with NIHL. Figure 4 refers to male farmers screened, and highlights the frequency of association between NIHL and tinnitus. Tinnitus serves to exacerbate the difficulties experienced by those with a NIHL, frequently interfering with sleep patterns leading to irritability and tiredness, subsequently placing the farmer at increased risk to varying degrees of accidental injury. Whilst tinnitus resulting from hearing hair cell destruction is often experienced long term, a variety of strategies, some with reasonable outcomes, have been developed to manage the effects.

Auditory skills depend upon the proper functioning of approximately 30,000 tiny cells in the inner ear as they react to vibrations received via the outer and middle ear, their conversion into nerve impulses which then are carried to the brain and there, converted into sound.

### Table 3: Utilisation of hearing protection whilst undertaking various on farm tasks. 1991

<table>
<thead>
<tr>
<th>Noise source/protection used</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tractor driving without cabin (n = 222)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using muffs</td>
<td>52</td>
<td>23.4</td>
</tr>
<tr>
<td>Using plugs</td>
<td>5</td>
<td>2.3</td>
</tr>
<tr>
<td>Using muffs and plugs</td>
<td>12</td>
<td>5.4</td>
</tr>
<tr>
<td>Protection not stated</td>
<td>141</td>
<td>63.5</td>
</tr>
<tr>
<td>2. Using chainsaws (n = 208)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using muffs</td>
<td>56</td>
<td>26.9</td>
</tr>
<tr>
<td>Using plugs</td>
<td>7</td>
<td>3.4</td>
</tr>
<tr>
<td>Using muffs and plugs</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Protection not stated</td>
<td>7</td>
<td>3.4</td>
</tr>
<tr>
<td>No protection</td>
<td>135</td>
<td>64.9</td>
</tr>
<tr>
<td>3. Using firearms (n = 187)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using muffs</td>
<td>21</td>
<td>11.2</td>
</tr>
<tr>
<td>Using plugs</td>
<td>10</td>
<td>5.3</td>
</tr>
<tr>
<td>Using muffs and plugs</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>Protection not stated</td>
<td>9</td>
<td>4.8</td>
</tr>
<tr>
<td>No protection</td>
<td>44</td>
<td>77.0</td>
</tr>
</tbody>
</table>

Source: Occasional Paper No. 91/1 Agricultural Health Unit, Moree Hospital

Figure 4: Incidence of NIHL and tinnitus in male farmers screened during Ag Quip 1991 and 1992
Sounds are made up of different frequencies or pitches, with many thousands of hair cells needed to describe sounds to the brain in order to hear and understand. Exposure to loud noise permanently destroys the hair cells which are necessary to describe the soft consonant sounds, for example, ‘sh’, ‘p’, ‘th’, ‘t’, ‘f’. These hair cells are in the range measured by the audiometer at 3K through to 8K.

Loss of hearing sensitivity above 3K indicates hearing impairment, not deafness. Parts of words are heard with the rest often misheard and/or misinterpreted. In the background noise, hearing and understanding speech is made even more difficult as sounds become absorbed into the noise.

Frequently, the hearing impairment presents gradually. As the farmer commonly works in isolation, the loss tends to become evident within the family and social circle, often resulting in friction within the family unit and withdrawal from social activities.

Information gained from members of the rural sector suggests a traditionally conservative approach to the acquisition of any form of assistance for their hearing loss. Such reticence has often been based on the belief that nothing can be done for their type of hearing loss, and/or the associated tinnitus. With the range of technological advancements over the past two decades, great strides have been made in the development of hearing aids and the many other forms of assistive listening devices.

Whilst hearing aids will not restore the hearing levels previously held but now lost as a result of exposure to noise, if fitted by appropriately trained and experienced professionals they offer considerable assistance to the hearing aids, a significant number of farmers can once again participate and enjoy activities previously denied them due to their hearing loss.

Appropriate use of assistive listening devices by those with a NIHL, greater opportunity for improved communication by phone, within vehicles, at meetings and other gatherings and social functions are available. Listening to and gaining enjoyment from hearing the television and radio is once again possible. Such devices may be used with or without hearing aids. By offering a Rural Hearing Screening program where significant numbers of rural workers congregate, the opportunity exists for having such devices available for inspection, trial and consideration of the many options.

A National Strategy for Rural Hearing Conservation

The Rural Hearing Screening and Conversation Program developed in the New England region, while not yet perfect, could well form the basis of a national rural hearing health program. For this to be successfully implemented, a policy aimed at ensuring all rural health care workers are appropriately trained and supported to assist the rural sector by raising awareness of the hazards of noise and the implications of a NIHL to the individual and the family/significant others, is required. If the rural sector is to take responsibility of ensuring their workplaces are safe environments, such a policy is a pre-requisite.

In 1990 the NSW Farmsafe Committee developed strategies for a Hearing Conservation Program. The Program, based on the New England experience, incorporated primary, secondary and tertiary strategies to reduce the risk of NIHL, technical solutions to noise reduction, current legislation, education and training resources. Farmsafe Australia is in the process of developing a number of strategies, among which rural hearing conservation is included. Therefore, a national policy approach to rural hearing conservation is considered timely.

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2 NSW Farmsafe Committee, Hearing Conservation Program, NSW Rural Training Council, Sydney, 1990

3 Clarke L., Profile of Farm Health and Safety - A Preliminary Report, prepared for the National Farmsafe Secretariat, Agricultural Health Unit, May, 1992
Whilst the New England Program has developed an information base which has been fully utilised and reviewed throughout the implementation process, a national program would require detailed attention to the collection, interpretation and maintenance of quality data. This data would lend itself to strict monitoring of the problem nationally, whilst at the same time provide the basis for program evaluation, particularly in terms of efficiency and effectiveness. With some modification, infrastructures to develop an information system such as this are already in place.

The development of an optimal skill base within the rural health care workforce requires considerable training initially, with support continuing to allow for regular updates and practice review. Currently, such training is offered to varying degrees through a variety of avenues particular to the workforce category. At present, the nature of the role of rural health care requires workers to hold a particular skill base whilst maintaining a broad overview of the range of health care issues. For these workers, specific training, whilst continuing to be based on the sensory skill of hearing and the assessment and management of hearing loss, must be extended to incorporate the risks associated with noise, screening for NIHL, management of a NIHL and hearing conservation programs.

For nurse audiometrists in particular, training is offered through the Open College Network of New South Wales TAFE. The course, which has operated since 1985, has been supported through an agreement with New South Wales Health, and provides for the training of 26 currently registered and appropriately experienced nurses each year. The past twelve months has seen a change in the entry criteria, allowing for placement of those expressing interest from within the private health sector. Very often these students are from rural areas, being an integral part of the local professional network.

In line with changes to nursing education and the procedures for acquisition of post graduate nursing qualifications, competency training ideals are being incorporated into the nurse audiometry training course. Options for transferring the course to a more appropriate training body have been considered. To date, no decisions have been made regarding such a move, although continued effort will be given to developing recommendations for future action.

Experience in the New England region saw considerable financial resources allocated to the program in the first few years. Whilst not significant in terms of overall resources consumed in the health region, the initial costs of staff training, equipment purchase and facility modification consumed the bulk of this allocation. Staff movements subsequently have necessitated a continuing commitment on behalf of the region to the provision of resources necessary to maintain the supply of trained personnel. The need to consistently review facilities within service areas and maintain equipment is regularly reinforced to those responsible for the health service overall.

Distance is a major problem for rural communities and their health workers. Although it is common to find sound professional networks within small, isolated communities, opportunities to step outside this network and draw on the experience of others is vital to maintaining and further developing this supporting structure.

In rural areas the infrastructure supporting hearing services in New South Wales has developed around a number of key players, namely, nurse audiometrists, audiologists, community support and liaison groups, Farmsafe committees and a range of private sector businesses, in particular, those dealing in hearing conservation and the provision and maintenance of hearing protection. Although less well developed, similar infrastructures can be found in Tasmania, the Australian Capital Territory and the Northern Territory.

Opportunities exist to further consolidate the benefits which are achievable through a more considered integration of the local networks with the infrastructure already in place. Rural health workers and their families access information and support from a variety of sources. In areas where attempts have been made to standardise the services provided, often a successful outcome has been hampered by either dysfunctional community and professional supporting networks, or a complete lack of such networks. Thus, a farmer, as the consumer, has access to varying levels of service between areas.
Summary

Noise induced hearing loss is preventable. If acquired, it is easily identifiable and manageable within the rural community. A rurally oriented national approach to managing the issues, based on enhancement of current infrastructures, is supported by data, rural health professionals, as well as consumers, being members of the rural community.
Appendix 1

Mean values for hearing thresholds at each screening frequency in ten-year age groups of farmers and graziers, Ag-Quip 1991 (O=Right ear, X=Left ear)

15-24 YRS
N = 34

25-34 YRS
N = 43

35-44 YRS
N = 50

45-54 YRS
N = 47

55-64 YRS
N = 56

65+ YRS
N = 15