



Department for Work and Pensions

**Department for Work and Pensions Social  
Security Administration Act 1992**

# **Occupational Deafness**

Report by the Industrial Injuries Advisory Council in  
accordance with Section 171 of the Social Security  
Administration Act 1992 reviewing the prescription  
of occupational deafness.

*Presented to Parliament by the Secretary of State for Work and Pensions  
by Command of Her Majesty  
November 2002*

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## **INDUSTRIAL INJURIES ADVISORY COUNCIL**

*The Rt Hon Andrew Smith MP*

*Secretary of State for Work and Pensions*

Dear Secretary of State,

### **REVIEW OF THE SCHEDULE OF PRESCRIBED DISEASES**

#### **OCCUPATIONAL DEAFNESS**

In February 1997 the Council announced that it would be undertaking a review of the current schedule of occupational diseases for which benefits are paid. The terms of reference for the review are to examine the diseases currently prescribed in the Social Security (Industrial Injuries) (Prescribed Diseases) Regulations 1985. In particular the Council was to confirm that the statutory requirements for prescription continue to be satisfied for each disease, to identify any amendments required to ensure they reflect current scientific knowledge, to identify measures to improve the speed and ease of processing claims and reduce the administrative cost of identifying and paying those entitled to benefit, and to review the effectiveness of benefits, given the different circumstances of people with different prescribed diseases.

Although the Review is considering the list of prescribed diseases as a whole, within that, the Council identified certain individual diseases as requiring early consideration. Occupational deafness was considered to need particular attention, and the Council decided that a dedicated sub-group - the Occupational Deafness Working Group - should be set up and asked to report to the Council on their findings. The Occupational Deafness Working Group issued a consultation paper on 10 August 1998 about the occupations which should be included in the prescription for occupational deafness, and has taken into account the comments that were made. Rather than produce a very long report at some point in the future, we thought it appropriate to bring reports on discrete parts of the list of diseases to you as the Council completes the necessary work.

Occupational deafness is unusual among prescribed diseases in that the threshold for benefit payment is not 14% but 20% disablement. At the time of the original prescription in 1975 there was considerable scientific uncertainty about noise injury and its effect on hearing, which it was hoped would be resolved with time. The Council's reports on occupational deafness since prescription, however, have not focussed on scientific aspects and a principal aim of this review has been to evaluate more recent research findings. Although since 1973 much high quality research has been reported worldwide, there remain, unfortunately, significant gaps in relevant scientific knowledge. Because the advice of the Council is circumscribed by available scientific evidence, these gaps have limited the scope of our recommendations on occupational deafness, particularly in relation to compensation threshold and aggregation. The review has, however, identified relevant areas for further study, and it is to be hoped that new evidence will be forthcoming. The Council will keep these issues under review.

I enclose our report which recommends that, in the light of evidence currently available, certain amendments to the terms of the prescription for occupational deafness (prescribed disease A10) should be made.

Yours sincerely,  
Professor A J Newman Taylor  
*Chairman*

Date:

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# 1. EXECUTIVE SUMMARY AND SPECIFIC RECOMMENDATIONS

## Executive summary

- As part of the review announced by IIAC in February 1997, of the current Schedule of occupational diseases for which benefits are paid, occupational deafness was considered to need particular attention.
- The terms of reference of the review of the Schedule were to confirm that the statutory requirements for prescription continue to be satisfied, to identify any amendments required to ensure they reflect current scientific knowledge, to identify measures to improve the speed and ease of processing claims and reduce the administrative cost of identifying and paying those entitled to benefit, and to review the effectiveness of benefits, given the different circumstances of people with different prescribed diseases.
- Occupational deafness was first prescribed in 1975, since when the Council has produced five further reports (most recently, a supplement to the 1990 report issued in 1994). These reports focussed primarily on the administrative aspects of the prescription, with recommendations aimed at increasing effectiveness and efficiency in claims determination. Recommendations also extended prescription by including additional occupational categories, reducing the time required in the listed occupations and increasing the time limits to claim.
- No recommendation was made in respect of changing the threshold level of deafness at which compensation is paid, nor on the fact that occupational deafness is the only prescribed disease not subject to aggregation at levels of disablement of less than 14%. An assessment for disablement below the lowest level at which payment is normally made (ie less than 14%) can usually be aggregated with similar low levels of assessment for disablement arising from other occupational accidents or other prescribed diseases. As a result, the overall level of disablement may reach that at which payment is made (14% or more). For occupational deafness, percentage disablement is not assessed below 20% and there is, therefore, no level of disablement below 20% available for aggregation.
- Current legislation provides that the disablement assessment for occupational deafness in individual cases is based on all hearing loss, not just that due to noise injury. However there seems no reason in logic or fairness why the compensation threshold for occupational deafness, nor the opportunity for aggregation should be different from other prescribed diseases.
- An important aim of this review has therefore been examination of the scientific evidence which has emerged since 1975 which could inform a recommendation about compensation threshold and aggregation.

- During this period, much research of high quality has been reported. However, there remain significant gaps in the areas investigated, in particular in relation to the quantitative relationship between occupational noise exposure (both intensity and duration) and the resultant sensorineural hearing loss.
- Because the advice of the Council is circumscribed by available scientific evidence, these gaps have limited the present scope for recommendation for change on compensation threshold and aggregation.
- We have identified relevant areas for further study, which we hope will inform future recommendations. In particular we recommend research to investigate the quantitative relationship between exposure to noise at work and the risk of developing sensorineural hearing loss. The Council, through its Research Working Group will monitor this research.

## **Specific recommendations**

1. The Council recommends that:

1.1. The occupations prescribed for prescribed disease A10 should be amended. The aim would be to focus on work patterns/circumstances likely to lead to sufficient noise exposure to cause noise-induced hearing loss rather than merely use of the tools and techniques incidental to the employment. Suggested amendment is informed by expert evidence, including from the Health and Safety Executive. Specific changes relate to:

- a) water-jetting - to focus on water-jetting operations undertaken at pressures above 10,000 psi (or 680 bar) for water jets or a mixture of water and abrasive material in the water jetting industry (including similar work under water).
- b) forestry - to clarify, following judgement in the Court of Appeal, that the word “forestry” is not restricted to work in the forestry industry.
- c) mechanical bobbin cleaning - to make clear that the mechanical means of cleaning bobbins is prescribed, not the cleaning of mechanical bobbins.
- d) high speed false twisting - the intention is to include this process only when it takes place prior to knitting/weaving.
- e) band-saws - to reflect more properly the range of wood-working machines which should be covered.
- f) work as police firearms training officers and shot-blasters using abrasives carried in air should be added to the list of prescribed occupations.

1.2 The current approach to assessment of occupational deafness and the present disablement scale should continue to be used.



1.3 Pure tone audiometry (PTA) should be retained as the most appropriate routine assessment method for use in the benefit scheme. Where testing is not repeatable, or response to conversational voice seems better than the audiogram would suggest, use of evoked response audiometry (ERA)<sup>1</sup> should be considered.

1.4 The forms issued to employers in relation to claims for this disease, and the notification letters issued to claimants, should be reviewed by Jobcentre Plus to ensure they are straightforward to complete.

1.5 A revised grouping of prescribed occupations should be introduced.

1.6 The rule that a person must claim within five years of leaving one of the prescribed noisy occupations, and that they must have worked in at least one of those occupations for at least ten years, should remain in place. Potential claimants should be made aware of their eligibility to claim benefit and the need to claim within 5 years of leaving a noisy occupation.

1.7 Initial assessments for occupational deafness should normally be final [although a person who continues to fulfill the occupational requirement may ask for review at a future date, and the possibility of the claim being reviewed if circumstances change is not precluded].

1.8 People whose hearing loss is below the threshold when assessed for benefit purposes should not be given the impression when they receive the written decision from Jobcentre Plus that they are not suffering from impaired hearing. The point is that they do not qualify for benefit under the rules of the benefit scheme, which is not the same as saying that they have no hearing impairment at all. Recent changes made to the decision notifications by Jobcentre Plus have taken this point into account.

1.9 No changes should be made to the current methods of identifying and assessing pre-existing deafness.

1.10 It remains inappropriate to introduce an off-set for conductive hearing loss.

1.11 Revised guidance on tinnitus assessment in the Scheme should be issued to doctors advising Jobcentre Plus decision-makers.

1.12 The threshold for compensation should be maintained at 50dB bilateral sensorineural hearing loss, averaged over 1, 2, 3 kHz .

1.13 Current evidence does not yet provide sufficient basis for recommendation of aggregation, except where the normal requirements for prescription of occupational deafness are met.

1.14 Scientific and other relevant developments which might impact on prescription should be kept under regular review.

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<sup>1</sup> ERA is a non-invasive method for the objective assessment of hearing acuity. Different responses can be recorded from different parts of the auditory pathways. Techniques are chosen on the basis of the patients' age and the type of information required. For medico-legal purposes cortical evoked response audiometry (cERA) is most frequent. (see Appendix 6).

## 2. INTRODUCTION

### Background to the Review

2. In February 1997, the Council announced that it would be undertaking a review of the current schedule of occupational diseases for which benefits are paid.

3. The terms of reference for the review are to examine the diseases currently prescribed in the Social Security (Industrial Injuries) (Prescribed Diseases) Regulations 1985 (as amended) and, in particular:

3.1 to confirm that the statutory requirements for prescription continue to be satisfied in respect of each of the prescribed diseases considered;

3.2 to identify amendments required to the wording, layout and grouping of the diseases prescribed to ensure they reflect current scientific knowledge and clearly express the Council's intention;

3.3 to identify measures to improve the speed and ease of processing claims for prescribed diseases and reduce the administrative cost of identifying those entitled to benefit, and of assessing and paying benefit;

3.4 to review the effectiveness of benefits, given the different circumstances of people with different prescribed diseases.

4. In the context of this review we identified occupational deafness as a disease which needed particular attention: it is one of the most frequently claimed of all the prescribed diseases, and the surrounding scientific issues are complex. The Council were particularly conscious of the changes, in industry, in EU and UK Health and Safety legislation, and in the growth of the scientific literature on hearing loss since occupational deafness was first prescribed, and since the schedule of diseases was last reviewed as a whole in 1981. An Occupational Deafness Working Group was set up by the Council to review the disease within the terms of reference set out above, and report back to the Council.

### Technical aspects of hearing and noise

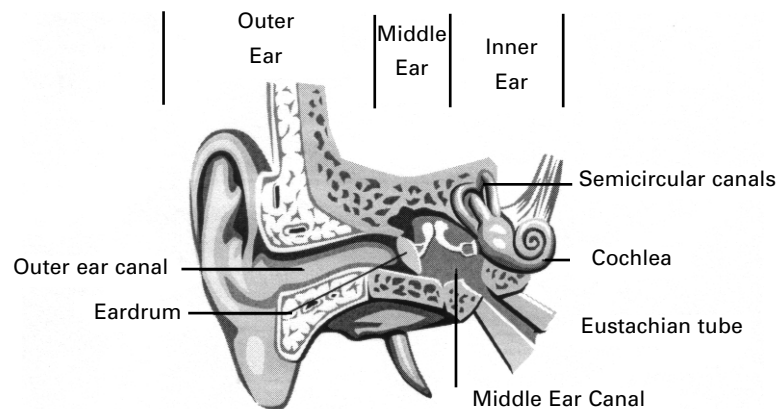


Fig 1. The Ear

5. Sound is the propagation of pressure waves radiating from a vibrating body. As with all waves, (including visible light and radio waves) sound waves are characterised by their frequency and amplitude. High pitch sounds have a high frequency and low pitch sounds a low frequency. Wave frequency is measured in Hertz (Hz). Loud sounds have a high amplitude (intensity) and quiet sounds a low amplitude. The human ear can respond to a very wide range of intensities and for convenience a log scale is measured with units Bels. In practical terms one tenth of a Bel or decibel (dB) is more convenient for the size of the numbers involved. One dB approaches the smallest change in intensity between two sounds that the human ear can distinguish. Decibels do not add together arithmetically, so if two machines both emitting 70 dBs are adjacent to each other the cumulative sound level is not 140 dBs, but about 73 dB. A whisper has an amplitude or intensity of about 30dB, normal conversation 60dB and a pneumatic drill, about 100 dB at the point of origin.

6. Sound is detected by the cochlea within the ear. Anatomically, the ear is divided into three parts, the outer, middle and inner ears. The outer ear consists of the trumpet shaped auricle on the side of the head, and the external auditory meatus, which joins the auricle to the temporal bone of the skull. The middle ear is separated from the exterior by the ear drum or tympanic membrane. It is an air filled cavity in the temporal bone, connected to the throat through the Eustachian tube. The three auditory ossicles, malleus, incus and stapes are small bones that provide a mechanical link between the outer and inner ears. The inner ear is divided into the vestibular labyrinth, important in balance, and the cochlea, which contains the Organ of Corti, and its thousands of sensory hair cells. The acoustic (8th cranial) nerve passes to the brain from the inner ear.

7. Sound waves in the air are collected by the auricle, and passed down the external auditory canal to the ear drum, making it vibrate. These vibrations are then transmitted through the middle ear by the ossicles, and the fluid of the inner ear is set in motion. The nerve cells of the Organ of Corti are activated, to stimulate nerve impulses which are transmitted to the brain along the acoustic nerve.

8. Such a complex system can be damaged in many ways. Conductive hearing loss results from interference with transmission of sound through the external and middle ear to the inner ear. This can arise from blockage to the ear canal, tympanic membrane or ossicles. These losses can often be corrected by surgery. Sensorineural loss is the result of damage to the inner ear or auditory nerve, or both. Such losses are usually irreversible and permanent. Noise is only one of many causes of sensorineural hearing loss, which also include ageing, trauma, air pressure changes, diminished blood supply and toxic chemicals. A third type of hearing loss about which knowledge remains limited is central hearing loss, where the damage occurs in the central nervous system between the auditory nerve nuclei and the cerebral cortex. Individuals may have mixed types of hearing loss.

9. Hearing loss is the amount by which a person's hearing threshold level deteriorates as a result of some adverse influence. It is usually measured in decibels (dB). A hearing loss at particular frequency is the number of decibels by which a tone must be amplified for the person to hear it. Although not strictly accurate the terms hearing loss and hearing threshold level are often used synonymously. If hearing threshold begins at -15 dB and

changes to -5 dB, the person has suffered a hearing loss but if hearing threshold level started and remained at +5 dB, no loss has occurred. Pure tone audiometry is a behavioural test developed to measure hearing acuity. The audiometer generates pure tone signals of frequency 250 Hz, 500 Hz, 1, 2, 3, 4, 6 and 8 kHz at variable intensities ranging from -10 dB to + 110 dB, usually in steps of 5 dB. Average normal hearing 0dB is the reference level on audiometers. Signals of increasing intensity at each frequency are fed to the person tested who indicates when the test tone is heard. The hearing threshold levels are usually plotted on a graph, or audiogram, with sound intensity (dB) on the y axis and the frequency (Hz) along the x axis. Standard symbols are used to denote right and left ears. Audiometry separately measures overall hearing loss and cochlear (ie sensorineural) hearing loss.

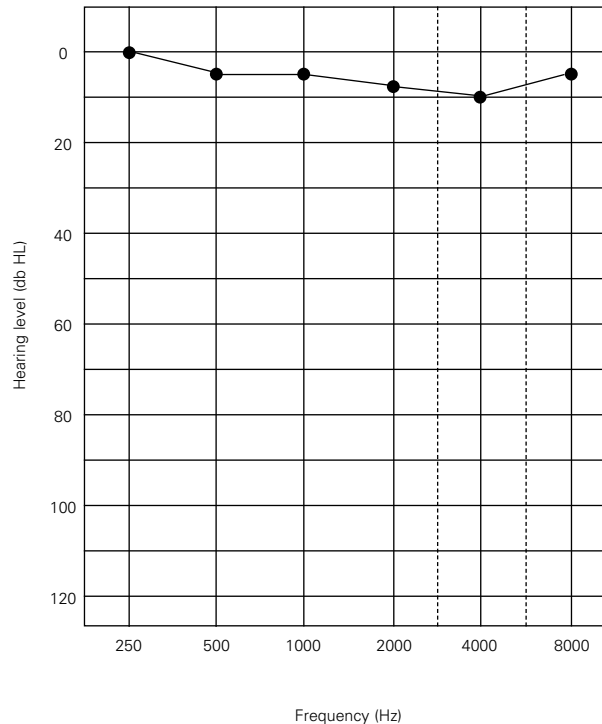


Fig 2. A normal audiogram

10. There are several potential extrinsic and intrinsic sources of variation in audiometric testing. The extrinsic variables include temperature, humidity of the environment and equipment features. These can be controlled. The intrinsic variables, e.g. the person's state of health, interest, motivation, familiarity etc are more difficult, but are addressed by having trained audiometricians, working to defined and quality assured standards and skilled in detection of non-organic or exaggerated hearing loss. Inaccurate results may result from several causes including audiometric inaccuracy, poor understanding of the test, or fatigue.

11. To measure overall hearing, the signal passes by air conduction via the external auditory meatus to the tympanic membrane, middle ear, inner ear and finally to the auditory cortex of the brain (air conduction (AC)). To measure cochlear sensitivity, the signal stimulates the cochlea directly by the

application of the vibratory stimulus to the skull (bone conduction (BC)). When measuring bone conduction, cross-transmission of the signal to the ear not under test is avoided by masking that ear. If the hearing loss is due to a sensorineural defect, the AC and BC thresholds will be the same. If there is a problem in the external or middle ear, in other words a conductive hearing loss, then there will be attenuation of the AC signal, and a gap will emerge between the air and bone signals. The person will hear better by bone than by air conduction. The greater the conductive hearing loss, the greater the air-bone gap (ABG).

### *Effect of noise on hearing*

12. Noise can be thought of as any sound which is unpleasant or unwanted or alternatively as a signal that delivers no information, and whose intensity varies randomly with time. For the purposes of this report noise is sound of sufficient intensity to damage hearing. Damage to cochlear hair cells from noise depends on the frequency, intensity and duration of the noise exposure, as well as individual susceptibility. Noise may be intermittent or continuous. The interval between exposures is important, as recovery may be possible from intermittent noise. Continuous noise exposure is more damaging than interrupted exposure. The classic audiometric evidence of early noise damage is the appearance of a notch on the audiogram between 3 and 6 kHz. The notch usually occurs first at 4 kHz, and then progresses to include the adjacent frequencies. At first this notch is temporary (known as temporary threshold shift), and after rest away from noise, hearing will usually return to normal. With continuing exposure this loss becomes permanent, ie permanent threshold shift. Noise damage is usually similar in both ears unless one ear is more exposed to noise than the other, e.g., shooting a rifle where one ear may be closer to the muzzle of the gun. Where stable noise exposure continues, the permanent loss at 4kHz will reach a maximum level after about 15 years. Initial hearing loss is asymptomatic, but problems, particularly in discriminating speech in background noise, e.g. understanding conversation in a noisy room, will begin when loss spreads to the lower frequencies, 2 or 3 kHz. At the same time as being noise-exposed, the person is also ageing, and age related loss will be superimposed on the noise damage. This occurs gradually over a period of years. Highest frequencies are affected first, causing the characteristic noise-induced notch to disappear from the audiogram.

### *Individual variation in hearing*

13. The early IAC reports noted wide variation in hearing amongst individuals. The Occupational Deafness Working Group examined the current evidence. More recent work confirms IAC's previous conclusion, and shows evidence of up to 30 dB variation at 2kHz in young otologically normal adults matched for age and sex. Susceptibility to noise and age also differs between individuals. The effects of age on hearing are well discussed in the medical literature (1). A comparison of the results of various studies of men exposed to similar levels of occupational noise (over the range 90-100dB) for 30 years showed that they had a large range of measured hearing threshold levels. The largest hearing threshold value corresponding to 90dB noise exposure was substantially larger than the smallest value corresponding to 100dB (2).

14. As discussed above, hearing loss is the amount (measured in decibels) of change for the worse as a result of some hearing insult. Benefit under the Industrial Injuries Scheme is paid for disablement resulting from loss of faculty. Loss of faculty is not defined in the legislation, but has been held in the courts as broadly equivalent to “impairment of the proper functioning of mind or body”. Disability, which is the basis of some compensation schemes and civil settlements is a more subjective concept. It was defined by the WHO in 1980 as “any restriction or lack of ability to perform an activity in the manner considered normal for a human being”.

### **Statutory requirements for prescription of diseases**

15. Disablement resulting from circumstances which would constitute an accident, will be covered by the accident provisions of the scheme whether only acute short-term effects are involved or whether there are ill effects long after the original accident. For hearing loss, this may relate to explosion or blast or brief exposure to very high intensity noise. When, however, the disabling disease is due to chronic long-term occupational exposure, the question is whether it might be added to the list of prescribed diseases or, in the case of a review, remain on that list.

16. The law requires that the Secretary of State may prescribe a disease where he is satisfied that the disease:

- ought to be treated, having regard to its causes and incidence and any other relevant considerations, as a risk of the occupation and not as a risk common to all persons; and
- is such that, in the absence of special circumstances, the attribution of particular cases to the nature of the employment can be established or presumed with reasonable certainty.

17. In general, in recent years, addressing prescription in respect of diseases has involved a standard approach. The Council looks for a workable, medically acceptable definition of the disease and a practical way to demonstrate on the balance of probability that in an individual the disease can reasonably be attributed to occupational exposure. Two main routes are taken.

### ***Clinical Features***

18. Evidence that an individual’s dermatitis is caused by occupation might lie in its improvement when the person was on holiday and its regression on return to work, or in the demonstration of allergy to a specific substance with which there is contact only at work. It can even be that the disease only occurs as a result of an occupational hazard (e. g. coal workers’ pneumoconiosis). Although for occupational deafness, on occasions some improvement in hearing may be reported at weekends or when individuals are on holiday, permanent sensorineural hearing loss due to noise is not clinically different from hearing loss due to a number of other causes, and so cannot be attributed to work by clinical means only. The 4 kHz audiometric notch (see paragraph 12) is characteristic of noise induced hearing loss, but is not present in all cases.

### ***Doubling of risk***

19. Where, as can occur in the cases of noise-induced hearing loss, disease that results from exposure to an occupational hazard is indistinguishable from the same disease when present in someone who has not been occupationally exposed to the hazard, attribution to occupation on the balance of probabilities depends on epidemiological evidence that work in the prescribed job or with the prescribed occupational exposure increases the risk of developing the disease by a factor of two or more. The requirement for at least a doubling of risk is not arbitrary. It follows from the fact that if a hazardous exposure doubles risk, for every 50 cases that would normally occur in an unexposed population, an additional 50 would be expected if the population were exposed to the hazard. Thus out of every 100 cases that occurred in an exposed population, 50 would have been expected to develop the disease even in the absence of the exposure while the other 50 did so only as a consequence of their exposure.

20. The evidence required should ideally be drawn from a variety of research sources, and be sufficiently robust to give confidence that further research would be unlikely to indicate that prescription was not justified. Although it is not a requirement that research evidence used by the Council has been published or accepted for publication in the peer reviewed scientific or medical literature, this is usually the case.

21. Occupational deafness was originally prescribed before adoption of the “doubling of risk” approach. In any case, although there are many data on the topic, there has been a lack of published evidence relating noise dose to consequent hearing loss of the type necessary for the determination of risk. During the present review an investigation of contemporary evidence of doubling of risk was undertaken and the results of enquiries are set out in detail at paragraphs 68-76.

### ***Previous Council Reports - Basis for prescription of occupational deafness***

22. The existence of an association between occupational noise and deafness has long been recognised. In 1961 a sub-committee of the Council carried out a fact-finding research survey on noise and deafness, concluding that more knowledge was needed. As a result a programme of research on hearing and noise in industry was undertaken jointly by the Medical Research Council (MRC) and National Physical Laboratory (NPL). The findings were appraised by IIAC, and in their 1969 report (Cmnd 4245) the Council concluded that while important and difficult questions remained, in principle the case for prescription was now established. The MRC/NPL research looked at the effect of industrial noise on hearing in a group of subjects with a wide range of occupations. It compared the state of hearing of people with different known histories of noise exposure and its results provided the scientific basis of the equal energy principle: equivalent amounts of acoustic energy produce equal amounts of hearing loss (3). The term Noise Immission Level (NIL) represents the total noise energy incident on the ear over a period of time and resultant hearing impairment is directly proportional to the total immission. Since that date some limitations in the equal energy principle have been identified but the Council remains of the view that the early work remains valid, and is an appropriate basis for the current prescription.

23. The 1973 IIAC report (Cmnd 5461) formally investigated the prescription of occupational deafness, focussing on three key questions.

A. Is noise-induced hearing loss a disease within the meaning of the industrial injuries scheme legislation?

B. Is noise-induced hearing loss a risk of occupation?

C. Can the extent of injury due to occupational noise be distinguished in the individual claimant?

24. For question A, the Council concluded that although damage to hearing by noise was insidious, and early hearing loss not necessarily apparent to the individual, there were degrees of hearing loss which were disabling - and which could constitute a prescribed disease within the meaning of the Industrial Injuries Disablement Benefit scheme.

25. As to B, whether noise-induced hearing loss was a risk of occupation, the Council took note that few of the diseases prescribed at that time were absolutely specific to occupation but that hearing loss was much the most common condition in the community which had so far been considered for prescription. In accepting noise-induced hearing loss as a disease of occupation, the Council's view at that time was that hearing loss due to noise was relatively rare in the general population. The Council considered that for diagnosis of occupational deafness a robust accurate history of occupational exposure to noise was essential, the purpose being to ensure sufficient noise exposure had occurred. To support this they recommended a minimum working time requirement in the noisy occupation.

26. The final consideration, C, concerned the likelihood of being able to distinguish the occupational element in an individual's overall sensorineural hearing loss. The Council acknowledged the complexities and uncertainties in the scientific evidence. They recognised that sensorineural hearing loss had multiple causes - inevitably co-existing in the same individual. The Council appreciated that noise-induced sensorineural hearing loss had no unique specific features and while there was thought to be a characteristic audiometric pattern this might not be demonstrable in the individual case. Both diagnosis of occupationally related noise-induced sensorineural hearing loss and its accurate differentiation in an overall sensorineural hearing loss were challenging. The Council recommended that :

26.1 the compensable hearing loss should be of a specified level (paragraph 65 of the report);

26.2 appropriate technical and specialist services should be available for diagnosis and assessment of occupational deafness, and

26.3 there was a need for closely drawn occupational coverage to clearly identify jobs that produced sufficiently high noise exposure levels.

27. The Council in 1973 did not seek evidence for a quantitative relationship between noise exposure and the risk of disabling hearing loss or for evidence of a doubling of risk. Since prescription in 1975, the Council has produced further reports on occupational deafness (a short history can be found at Appendix 2). Early reports largely accepted the scientific basis and assumptions of occupational deafness prescription and did not evaluate the evolving scientific evidence, but primarily focussed on administrative aspects of the prescription, with recommendations aimed at increasing effectiveness and efficiency of case determinations. Recommendations also extended prescription by including additional occupational categories,



reducing the time required in the listed occupations, and increasing the time limits to claim. The original time limit to claim within 12 months of leaving the noisy job was revised to within five years of leaving the noisy job. The focus of the present review has been on scientific and technical issues, and any changes in understanding which might inform prescription.

## Method of current investigation

28. The Council, by means of a press release announcing its review of the schedule of diseases as a whole, asked for evidence to be submitted by 30 April 1997. In relation to occupational deafness, the Council also set up a sub-group in June 1997 (the Occupational Deafness Working Group) which included two co-opted Health and Safety Executive representatives. Over the last thirty years, there has been much otological research, technical developments in noise and hearing measurement and expansion in legislation on hearing protection. This has generated a very considerable specialist literature. As part of the review, the group examined the published international literature (a bibliography is attached at Appendix 7) and wrote directly to a range of experts in relevant fields (see list at Appendix 5). The appendix also lists others who provided evidence. Professor Davis, Professor Luxon, Mr Lawton and Dr Palmer provided both written and oral evidence. To clarify the occupations that should be covered by the prescription, a consultation paper was issued in August 1998. The responses are considered at Chapter 4 of this report. We have also received information from the Department for Work and Pensions and Jobcentre Plus, particularly on service delivery issues.

## Claims Activity

29. Since its prescription, occupational deafness has generally attracted more claims on a regular basis than any other prescribed disease. It is, with pneumoconiosis, chronic bronchitis and emphysema, and vibration white finger, one of the four most claimed diseases. On average over the last 5 years there have been 5,400 claims per year. This is about 10% of all claims for prescribed diseases. [Source: Analytical Services Division].

30. The number of first awards of benefit for occupational deafness, prescribed disease A10, made over the last five financial years is shown in the table below. A significant proportion of claims is unsuccessful because of failure to meet the occupational requirements.

1996/97	1997/98	1998/99	1999/00	2000/01	Total
377	319	260	302	229	1,487

**Source:** Analytical Services Division

31. In 1999/00, benefit of £700 million was paid in respect of Industrial Injuries Disablement Benefit (IIDB). Of this, £35 million was paid for occupational deafness (PD A10) which represents 5% of the total spend. The cost of administering IIDB in 1999/00 was approximately £59.3 million, of which approximately £2.9 million was spent in respect of PD A10.

32. As at 1 April 2000 there were 14,000 recipients of disablement benefit in respect of occupational deafness and currently more people receive benefit for this prescribed disease than any other. One hundred and eleven different industries are represented, but of those four make up more than half (52%) of the case-load.

### **Proportion of Occupational Deafness case-load by industry - April 2000**

Shipbuilding	21%
Coal mining	13%
Metal manufacture and engineering	14%
Manufacture of railway, tramway locomotives and rolling stock	4%
Others	48%

33. Over the last 20 years, there has been a reduction of approximately two thirds in people employed in heavy industry in the United Kingdom, and major occupations now contributing to occupational deafness claims are mainly metal machining and related trades. Mineral extraction and building trades and machine operators (other than metal) and assemblers continue to be sources of claims, but claims from ship-building and mining are now less common.

34. It would be valuable to know the proportion of the total UK population affected by work related noise-induced hearing loss who claim, and ultimately receive, awards under the Industrial Injuries scheme for occupational deafness. Unfortunately that information is not presently available. A principal aim of the National Study of Hearing was to inform a needs assessment for hearing health care in the United Kingdom. The main risk factors for hearing impairment are now established as age, sex and occupational group, with age and sex being considerably the more important. Smaller contributions are made by noise, other identifiable causes including viruses, therapeutic drugs and childhood middle ear disease. A recent estimate suggests that there are about 8.8 million people in the United Kingdom with an average of 25 or more dBs hearing loss in the better ear. Men are more commonly affected than women. The survey on vibration and health described at paragraph 77 of this report calculated the noise attributable burden of hearing difficulty in Great Britain, estimating the number of cases of severe hearing difficulty (described as “wearing a hearing aid” or “having severe difficulty in hearing conversation in a quiet room” or both) as 153,000 men (95% confidence interval (CI) 88,600 -217,300) and 25,800 women (95% CI 0-56,000).

35. Health and Safety legislation since 1974 and specifically the Noise at Work Regulations 1989, have led to reduced employee exposure to noise at work, and advances in production engineering have meant more automated processes in the workplace with increasingly, separation of the worker from sources of noise. There have also been radical changes in employment patterns. Implementation of improved practice was not immediate but since the mid 1980s effective hearing conservation programmes have become widespread in industry (4). The overall number of employees exposed to very high levels of noise should therefore be declining, although in some occupations such as in the leisure industry, noise exposure has increased.

### 3. MAIN ISSUES FOR CONSIDERATION

36. The term 'deafness' is commonly used to denote a general loss of the capacity to hear, without identifying the degree or cause of loss. Industrial deafness, chronic acoustic trauma deafness and noise-induced deafness are all used to describe the sensorineural hearing loss (usually bilateral) which may result from exposure to continuous or intermittent loud noise. In this report the phrase 'noise-induced hearing loss' is used for simplicity, although the technically correct term is 'noise-induced permanent sensorineural hearing level threshold shift'.

37. The terms of prescription are set out at Appendix 1. The current definition of the disabling disease, occupational deafness, for benefit purposes is: Sensorineural hearing loss amounting to at least 50 dB in each ear, being the average of hearing losses at 1, 2 and 3 kHz frequencies and being due in the case of at least one ear to occupational noise. The Council in its 1973 report<sup>2</sup> that recommended prescription explained that its enquiries were concerned with 'the effects of prolonged exposure to noise which cannot be covered by the accident provisions of the Act'.

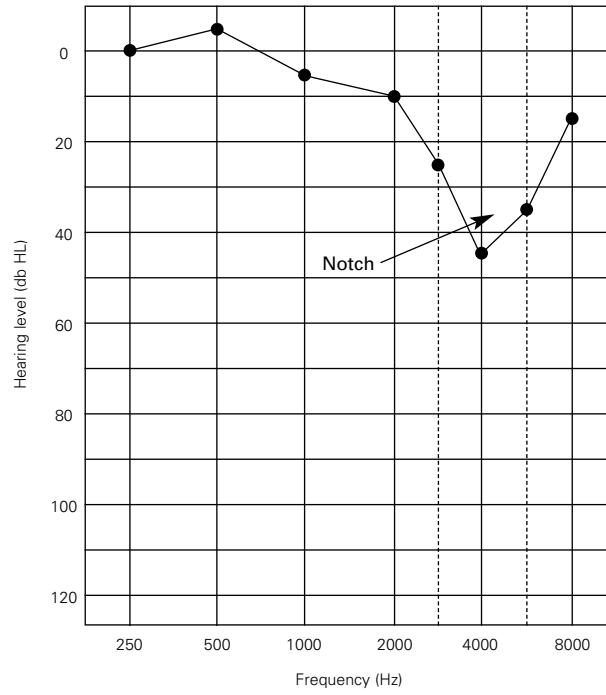
#### **Diagnosis of noise-induced hearing loss for benefit purposes**

38. Prior to prescription, limitations surrounding the demonstration and identification of noise-induced hearing loss and its distinction from other types of sensorineural hearing loss were appreciated. It was known there were no specific symptoms and there were other possible causes of sensorineural hearing loss. It was also known that because of variation in sensitivity to noise a history of employment in a noisy environment only implied the possibility of the diagnosis. There was, however, thought to be a characteristic audiometric pattern. From the analysis of the Medical Research Council/ National Physical Laboratory (MRC/NPL) data collected in the early 1960s it was shown that noise-induced hearing threshold shift was nearly always greatest at 4kHz and less on either side of this frequency. This was also the first feature to appear and the notch frequency and depth were usually highly correlated between right and left ears.

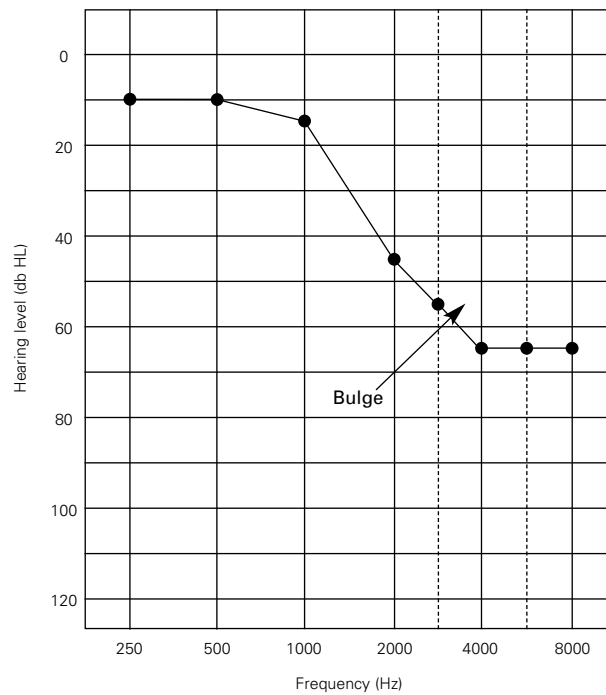
39. Since then further audiological research (5,6) has indicated that the pattern is neither inevitable, nor exclusive to noise. Audiograms with a notch at 4 kHz may be seen due to sudden viral hearing loss or ototoxic drug exposure. Further, the noise notch may also occur at 3 or 6 kHz, and with ageing, permanent hearing loss extends to frequencies above 3 kHz so the notch may be lost. The slope of the audiogram may be very deep and abrupt, with normal hearing at 500 Hz and one kHz, and a large drop of 40 or more dB at the centre of the notch. Conversely a shallower slope or bulge may be seen. Accurate diagnosis cannot then be based on audiometric pattern alone but requires other supporting evidence. At present the accurate diagnosis of noise-induced hearing loss remains difficult, particularly in high volume claims systems, like the Industrial Injuries Benefit Scheme where it is necessary to balance diagnostic accuracy against administrative simplicity and speed.

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<sup>2</sup> Occupational Deafness Cmnd 5461 published in October 1973.



**Fig 3.** A high frequency notch in the audiogram, typical of noise-induced hearing loss.



**Fig 4.** A bulge downwards and to the left in the audiogram, typical of noise-induced hearing loss plus presumed age associated hearing loss (AAHL)

40. It is generally accepted by experts in the field that there is a tendency to over-diagnose noise-induced hearing loss (7). In the context of the Scheme the diagnosis of occupational deafness is not limited to a pathological process, but is linked to an assessed level of overall sensorineural hearing loss. A relevant issue, therefore, is over-estimated hearing loss. Several of the experts consulted in this review as well as the published peer-reviewed literature, state that in 20 -50 % of claimants who appear, on pure tone audiometry (PTA), to meet the 50 dB criterion, the level of hearing loss recorded is over-estimated (8). Technically it would be possible to address this using the more objective cortical evoked response audiometry (cERA) but for a high volume scheme there are likely to be practical and resource implications in relation to the routine use of this. Pre-employment audiometry remains relatively rare amongst occupational deafness claimants and where it exists it may be of variable quality. For the future, quality controlled audiometry is desirable prior to taking up a noisy occupation.

41. During this review a new set of guidelines for the diagnosis of noise-induced hearing loss for medico-legal purposes was published (9). The process described is, however, complex and reliant on expert professional judgement. The specific aim is to assist expert witnesses in the courts and other medico-legal settings, with rather different determinations from that required in the no fault industrial injuries context. Comment on possible adaptation of the guidelines was obtained from one of the authors, but, on balance, it was judged that there remained serious practical limitations. Further expert comment was also obtained on increasing diagnostic accuracy. Suggestions included the routine use of a simple audiogram inspection tool, acoustic immittance tests to exclude middle ear pathology and otoacoustic emissions screening for noise damage. Overall however, in the individual, precise isolation of the occupational component of hearing loss remains impossible.

**We acknowledge the importance of accurate diagnosis of noise-induced hearing loss, but conclude that, at this time, we are not able to recommend implementation of the approach proposed in the recently published medico-legal guidelines.**

### **The time conditions for Benefit**

42. At the time that noise-induced sensorineural hearing loss was first prescribed a claimant had to have been employed for at least 20 years in total in one or more of the listed occupations. This was revised in 1983, and currently a condition to be met before benefit can be paid is that a claimant must have been employed for at least 10 years in total in one or more of the listed occupations. The rule helps to ensure that a successful claimant will have been exposed to sufficient occupational noise for a period long enough for it to be presumed that his or her deafness has a clear link to the job undertaken. Hearing loss at the notch frequency progresses rapidly for the first one to two years, continues for up to ten years, and then slows down. The rate and total degree of hearing loss are dose dependent. At lower frequencies, the loss is less, and the rate less severe. This spread to the lower frequencies is associated with symptoms, particularly difficulty in speech discrimination in noise. For the same amount of noise injury, there is variation in the pattern and progression of hearing loss dependent on individual susceptibility, and it is not possible to predict in an individual either the likelihood of progression or its rate (10).

**We conclude that there is no new scientific evidence to warrant change to the ten year condition for benefit.**

43. Currently, for prescribed disease A10, a claimant who has left a prescribed occupation must make a claim within 5 years of leaving that occupation. The reason is that permanent hearing loss due to noise exposure at work does not improve or deteriorate after ceasing work (11). In the period after a person ceases work, there may be other noise exposures due to new work, recreation and community noise such as traffic. Concurrently, the person will be ageing. These confounding effects are likely to increase with time, making it difficult to ensure focus on occupationally related permanent sensorineural hearing loss. Routine quality controlled audiometry at the end of the noisy employment would address this.

44. Lancashire County Council Welfare Rights Service informed the Working Group that they had undertaken several campaigns in the early 1990s to encourage take-up of Industrial Injuries Disablement Benefit for deafness. In their view only a small proportion of people who had damaged hearing at a level where they had a case for civil litigation, had a chance of making a successful claim for benefit. The rule that a person had to claim within five years of leaving a prescribed noisy job was said to be the main reason why such claims would fail. In our view this is an issue about take-up. Concern about awareness of eligibility rules was also raised by the Royal National Institute for Deaf People (RNID) and the Trades Union Congress. This issue is further discussed in Chapter 6: Service Delivery Issues.

**We conclude that there is no justification to revise the five-year rule regarding entitlement.**

## **Assessment of Noise-induced Hearing Loss**

### ***(1) Frequencies used for benefit purposes***

45. In 1973 the Council considered the most significant disabling effect of noise-induced hearing loss to be the loss of the ability to discriminate speech. Speech audiometry, which measures the percentage of words intelligible at different loudness levels of speech, and the percentage discrimination loss compared with normal, has face validity but there are technical difficulties, unreliability and a risk of subjective bias. The Council took the advice of the British Association of Otolaryngologists (BAOL) in 1973 that a suitable assessment measure of the disabling effects of noise-induced hearing loss would be hearing threshold level measured by pure tone audiometry averaged over 1, 2 and 3 kHz. These frequencies are predominantly involved in speech discrimination and produce reliable, repeatable audiometric results.

46. An authoritative detailed discussion of the quantitative assessment of hearing loss for compensation which included an historical overview was published in 1992 (12). This confirmed that different approaches have been proposed at different places and times over the last 60 years with as yet no consensus reached. It concluded that, for medico-legal purposes, pure tone audiometry remained the most appropriate method for supporting a diagnosis of sensorineural noise-induced hearing loss ie from the overall pattern of the tracing including the characteristic notch or bulge at 3, 4 or 6 kHz, and that assessment of hearing disability should be by measuring hearing threshold level in dBs averaged over 1, 2 and 3 kHz. This approach has been adopted in the UK courts.

47. We investigated frequencies used for assessment of hearing loss in other countries, particularly the use of 0.5 and 4 kHz (13). This confirmed the lack of consensus in approach, and the experts consulted in the review were generally of the opinion that the current process for assessment remains satisfactory.

**In the absence of compelling evidence to the contrary we recommend that it is appropriate to retain the current method of assessment (i. e. the use of pure tone audiometry at 1, 2 and 3 kHz).**

***(2) Scale used to link given levels of hearing loss to particular percentages of disablement***

48. The 1973 IIAC report (Cmnd 5461), with the advice of the BAOL, advised a scale setting the threshold of disablement at 40 dB averaged over 1, 2 and 3 kHz and in which each additional 5 dB hearing loss equated to 10% additional disablement. This made 50 dB averaged over 1, 2 and 3 kHz equivalent to 20%. 90 dB averaged over 1, 2 and 3 kHz equated to 100% disablement. Later research suggested that 90 dB did not represent absolute deafness.

49. In 1978 a new scale was recommended with onset of disablement at 30 dB, 50 dB averaged over 1, 2 and 3 kHz equivalent to 20% and 110 dB to 100%. This relationship is described by a sigmoid function with a 1% increase in assessment per dB increase in hearing loss up to 50 dB, 1.5% increase per dB from 51 -89 dB and finally a 1% increase from 90 -110 dB. In line with the general rules of the scheme, for award of benefit the assessment is rounded to the nearest multiple of 10.

50. As with the audiometric frequencies used to measure hearing loss, there is no consensus view on the disablement scale. It is important to note that different measures of detriment are used, e.g. impairment or disability, and some compensation schemes apply only to a single condition - hearing disability. The Industrial Injuries Scheme, on the other hand, relates to a wide range of disorders. Consistency and equity in assessment both within and across the conditions covered must be preserved. To do that, assessments must be in line with the schedule of assessments set out in the Social Security (General Benefit) Regulations 1982 Schedule 2. These statutory scheduled assessments act as benchmarks for all other assessments in the Scheme including occupational deafness.

51. The Occupational Deafness Working Group considered whether other scales should replace that currently in use and took the advice of expert clinicians and otological scientists. Scales considered included those in use in the various provinces of Canada and states of the United States, as well as France and Ireland. Particular attention was paid to the guidelines for medico-legal practice published by the Inter-Society Working Group on Hearing Disability (ISWGHD) in 1992. The assumptions, and constraints of the various scales differ. In the main they inform stand alone schemes for hearing loss, and unlike the Industrial Injuries scheme, have no need to take account of consistency or equity in assessment of a range of disorders included in the jurisdiction. Some concentrate on impairment, while others consider disability. Overall the experts we consulted recommended no change to the current scale.

**We conclude that the current DWP scale linking hearing threshold level to disablement should be retained.**

### **Non-occupational causes of hearing loss**

52. The intention of the Industrial Injuries Scheme is to make awards based on the level of disablement due to accepted accidents or diseases. Where there are other effective causes of a disability/disablement which would have existed regardless of occupational factors, e.g. due to constitution or ageing or an unrelated accident, these are normally excluded from the assessment. This does not apply in occupational deafness.

53. In the legislation relating to PDA10 Occupational Deafness, the wording is such that, once the diagnosis is met, the assessment of disablement is made on the overall hearing loss present due to all causes, i.e. the noise-induced sensorineural loss plus other causes of sensorineural hearing loss, particularly ageing and constitutional impairment, and any conductive hearing loss. The effect is that both occupationally caused, and non-occupationally caused hearing loss is included in the percentage assessment of disablement, and hence in the award.

54. The handling of occupational deafness claims differs from the approach to claims for most other prescribed diseases and accidents. In much of the scheme it is only the worsening effects of non-occupational causes of diseases which are taken into account. In effect the approach to assessment of occupational deafness is more generous.

### ***Conductive hearing loss***

55. Conductive hearing loss results from mechanical attenuation of sound waves in the outer or middle ear, preventing sound energy reaching the cochlea. The conduction of sound to the cochlea may be disrupted by:

- Blockage of the external auditory canal;
- Perforation of the tympanic membrane (the ear drum);
- Fluid in the middle ear; or
- Disruption or fixation of the ossicles (the small bones in the middle ear).

56. The Council has suggested in the past that a reduction (or 'off-set') should be made for conductive hearing loss if such loss can be identified and is clearly not occupationally caused. As discussed above, no such offsets are currently applied to occupational deafness claims. We reviewed present evidence.

57. The relation between conductive and noise-related hearing loss remains controversial and results of studies on the interaction between the two are inconsistent. Intuitively conductive hearing loss might act as a hearing protector. Some studies do suggest that a conductive hearing loss protects against subsequent noise damage (14). Others have not identified a protective effect (15). Hearing by bone conduction is normal in conductive deafness and the audiogram shows a gap between air and bone conduction. It might be thought that the amount of transmission loss of the middle ear could be easily measured by the difference between the air and bone conduction levels, the air-bone gap (ABG). However, in general the conductive hearing loss is not equal to the ABG. This is because of biological uncertainty and variation in individual ABG such that a measurable gap may



be recorded in the absence of a conductive hearing loss. Similarly, where there is a conductive loss due to middle ear disorder, the measured bone-conduction threshold may underestimate the true conductive loss because middle-ear obstruction also affects the other pathways by which externally applied cranial vibrations are transmitted to the cochlea (12). In civil claims subject to the ISWGHD guidelines adjustments are usually made for conductive hearing loss. However the methods used are complex and of uncertain scientific basis.

**On overall evidence we conclude that no change should be made at present to current arrangements which do not make an offset for conductive hearing loss.**

### *Ageing*

58. At the time of the Council's report in 1974 it was recognised that a significant cause of sensorineural hearing loss in claimants - particularly those over the age of 50 years - would be age-related hearing loss. Even if a person is not exposed to noise, hearing usually deteriorates with ageing. As work-related noise exposure continues, so too does ageing. Precise details of how noise-induced and age-related hearing loss combine remain to be established. The Council decided that no precise method to account for ageing was available, but following advice from the British Association of Otolaryngologists (BAOL), recommended a method of offsetting for age, by means of a 0.5 per cent deduction from the assessment at age 65 with a further deduction of 0.5 per cent for each year over 65 [Cmnd 5461 paragraph 93(9)].

59. Because of the rules which require percentage assessments to be rounded to the nearest multiple of 10 and the then limitations of testing equipment, in practice application of the ageing correction was rarely found to affect the final calculation. The matter was discussed in the Council's 1982 paper (Cmnd 8749) and advice was obtained from the BAOL and British Society of Audiology (BSA), particularly in light of other changes recommended in that report, e.g. replacement of the 12 month rule by a 5 year rule, which tended to increase the age of claimants seen, making a correction for age-related hearing loss (presbycusis) particularly relevant. On balance, however, it was concluded that the priority must be elimination of all complications lacking a clear scientific basis, and therefore the Council recommended that the presbycusis offset be abolished. That remains the position to date. This review considered current evidence on the matter.

### *Interaction between hearing loss due to noise and age*

60. The National Physical Laboratory (NPL) tables for the estimation of noise-induced hearing loss (NPL 1973) were based on the 1970 paper of Burns and Robinson (3) which predicts hearing threshold levels as a function of noise immission level and assumes that noise and age act independently on hearing. The NPL tables established the noise-induced component of hearing threshold level which is then added to an age-related component obtained from further tables (16).

61. Since there is a finite number of cochlear hair cells, near the limits the noise and age-related hearing components cannot remain additive but must be less than additive. This compressed addition relationship has been

described in international standards since the early 1980s - the current edition being ISO Number 1999: published in 1990 'Acoustics - Determination of noise exposure and estimation of occupational noise-induced hearing impairment', International Organisation for Standardization, Geneva (17). Further evidence supporting this assumption, including clinical studies, has become available since 1973. Several studies suggest that, at the age of 80 years, hearing would be the same whether the ear had been noise-exposed or not. (18, 19).

62. In the civil courts the element of hearing loss to be compensated is isolated from hearing loss due to other causes, particularly age, by application of age offsets. As discussed above, there is intrinsic marked variability in constitutional hearing and susceptibility to noise and ageing. This means that the particular normative data sets chosen make a considerable difference to the assessed hearing loss. The most appropriate reference values for age discount are currently the subject of wide audiological debate. The existing tables had origin in the 1970s and are now subject to re-scrutiny. Consideration is being given to issues such as background noise in the community - particularly non-occupational sources of noise injury and the nature of the most suitable control population, ie otologically normal or typical. (20, 21).

63. In light of all these uncertainties, the ongoing research and the fact that age offsets are not currently made in this Scheme, and bearing in mind also the need for administrative simplicity -

**We conclude that no change should be made with respect to taking account of the effects of ageing or to introduce an offset for these effects.**

### **Threshold for paying benefit**

64. For occupational deafness, awards become payable at 20% disablement: at 50 dB averaged over 1, 2 and 3 kHz. This contrasts with most other prescribed diseases where payment is made from 14% disablement, and in the case of pneumoconiosis and byssinosis, from 1%. It has always been recognised that the prescribed disease A10 definition sets a high threshold for award to be paid. Using the DWP scale, 14% disablement would be equivalent to a threshold of 44dB, so lowering the threshold from 50dB to 44dB would seem logical and fairer in terms of the rest of the scheme.

65. In recommending the 50dB threshold in 1973, the Council set out its reasons. It took into account technical and administrative matters, particularly the need in a large scheme to allow administrative expertise to build up and to avoid over-stretching audiological facilities and diversion from their main clinical functions. Since that date, these organisational issues have been resolved. The 1969 Report (Cmnd 4145) identified the difficulties in the "particular requirement imposed" by the legislation which is to decide what the picture would be in the individual case. The compensation threshold has not been explored in detail since 1973 (Cmnd 5461). Over the last 20 years, much new work has been done and in this review, the scientific evidence has been carefully reviewed in the context of deciding whether the threshold should be lowered.

66. Noise-induced hearing loss is a subclass of sensorineural hearing loss. In 1973 the Council was of the opinion that noise-induced hearing loss was relatively rare in the general population. Since then, the MRC National Study of Hearing has shown that significant sensorineural hearing loss is common in the general UK population, increasing in prevalence with age. (22). Some 16% of adults (age 17 to 80 years) have average threshold deficit (0.5, 1, 2 and 4 kHz) of 25dB or more; 4% have more than 45dB deficit and 1% more than 65dB in both ears. 9% have more than 45dB in one ear (23). The prevalence of hearing impairment is significantly affected by age. In the age range 51-60 years, 8% of people at the time of the survey had a bilateral hearing impairment in the range 35-45dB and about 5% above that range. Davis noted that the studies indicated that the prevalence of hearing impairment is not greatly associated with noise exposure, sex or occupational group, but predominantly with age (23). There is also evidence that occupational noise injury contributes less to overall hearing loss in the UK than previously considered.

67. The 1973 and 1982 Council reports acknowledged the possible impact of temporary threshold shift on the assessment method and compensation threshold for occupational deafness. On reassessment of a sample of cases, 31% showed improvement of 10 dB or more, while 13% no longer satisfied the criteria for diagnosis of occupational deafness. Expert advice in this review has again indicated that for accurate determinations there should be at least a 24-48 hours gap between noise exposure and test. However, care must be taken in setting such provision to avoid unacceptable disruption of the industrial process. Reflecting this, the scheme adopts only a 12-hour noise-free period before claimants can be assessed. This has been deemed acceptable in light of the high compensation threshold. Many compensation schemes throughout the world still impose longer strict noise-free requirements before diagnosis and assessment.

68. The Council's current approach to prescription is set out at paragraphs 15-20. The doubling of risk approach has usually been applied to discrete disorders which are easily diagnosed and evidently either present or absent. Occupational Deafness is a rather different concept, being essentially a level of sensorineural hearing loss. As required for prescription, there is long-established evidence that noise damages hearing and can result in a disabling level of hearing loss. Earlier discussion in this report highlights the difficulties of accurate diagnosis of noise-induced hearing loss and of differentiating elements of an overall hearing loss, particularly the age-related loss so as to isolate the noise-induced part. This makes difficult the final element of prescription, establishing the link between occupational noise and disabling sensorineural loss with reasonable certainty.

69. The Council faced a similar dilemma when considering the prescription of chronic bronchitis and emphysema in coal miners. In 1973 (Cmnd 5443) the Council concluded that there was insufficient evidence for prescription. By 1988 (Cmnd 379) evidence showed coal dust to cause adverse and disabling effects on the lungs but the relationship between lung function loss and cumulative coal dust exposure was unclear. By 1992, new published peer reviewed studies allowed recommendation of prescription in coal miners (Cmnd 2091). The research showed that the effects of coal dust and cigarette smoking were independent and that exposure to dust underground in miners could more than double the risk of a disabling

reduction in lung function. Applying similar logic to occupational noise exposure, the Council in this review explored the evidence on quantitative relationships between noise dose (intensity and duration) and the risk of developing disabling hearing loss.

70. We looked for specific evidence, preferably published and peer reviewed that cumulative noise exposure doubled the risk of a person acquiring a bilateral sensorineural hearing loss of 50 dB (20% disablement) over 1, 2 and 3 kHz. Further, to bring the compensation threshold into line with that for other prescribed diseases (ie 14% disablement), we also sought evidence on the noise dose required to double the risk of bilateral sensorineural hearing loss of 44 dB. For the purpose of the scheme, that noise dose could then be related to the list of occupations as set out in IAC Occupational Deafness Report, Cmnd 817. Literature search and expert opinion confirmed that to date no published peer reviewed studies of this kind exist.

71. New material was also explored. Measured noise dose data and control data derived from work done in the 1960s were used to provide information. Noise-exposed populations subject to a noise dose of 90 or 100 dB for 10 and 40 years, and non noise-exposed controls at appropriate ages were compared to determine the percentage of the noise-exposed and control populations expected to reach a hearing threshold loss of 44 dB or 50 dB. This information then allowed calculation of a risk estimate. Results suggested that in males 90 dB exposure for 40 years appears to produce a doubling of risk of reaching 44 dB relative to non noise-exposed subjects. Similarly, for 100 dB exposure in males, a doubling effect for both 44dB loss and 50dB loss is shown at 20 years.

72. An important consideration is the selection of the control group to represent the general population. Quite different impressions of risk can be obtained, dependent upon the degree of screening of the control subjects. Some control groups are highly screened, including only individuals with normal health, no wax in ears, no signs or symptoms of hearing loss and no undue exposure to noise, while others are minimally screened, simply excluding those with conductive hearing loss and occupational noise exposure. It is generally accepted that the National Study of Hearing data are particularly representative of the “typical” UK population. However, they are not ideal for application of this approach. They relate to age bands, not specific ages, and some of the bands particularly for older age groups, contain very few subjects.

73. Some indicative evidence based on typical populations was provided by a survey which was not specifically about hearing loss but rather looked primarily at vibration and health (24). The study included a semi-random sample of over 20,000 members of the UK working age population. As part of the questionnaire, information was collected on years of employment in a noisy job, whether the respondent wore a hearing aid, had difficulties in hearing conversation or had experienced tinnitus in the past year.

74. Associations of hearing difficulties and tinnitus with noise exposure were then examined, using logistic regression, with adjustments for age, sex, smoking and complaints of headache, tiredness and stress. The key findings were that:

- the prevalence of significant hearing difficulty and tinnitus increased with age in the working age population,

- the prevalence of both related to years spent in a noisy occupation, and
- particularly in men, working for more than five years in a noisy job carried a doubling of risk for severe hearing difficulty.

75. The study had limitations for our purpose, being based on questionnaire data only and there was no direct measurement of either noise or hearing threshold. Nevertheless, these findings are of considerable interest, and in the opinion of the Council should be extended, using a similar approach, with measured hearing threshold level and noise dose.

76. In logic and fairness, the threshold for payment of benefit in cases of work related noise-induced hearing loss should be 14%, in line with other prescribed diseases. Recommendations of the Council are, however, necessarily constrained by the quality of contemporary evidence. Clear objective demonstration of a doubling of risk of attaining 44 dB hearing loss following exposure to a known noise dose would form the grounds for evidence-based recommendations on the threshold.

**We conclude that on present evidence, awards should continue to become payable at 20% disablement, ie 50 dB bilateral sensorineural hearing loss averaged over 1, 2 and 3 kHz. Through its Research Working Group, the Council will continue to monitor relevant research findings.**

## **Initial assessments**

### *Period and type of award*

77. At present, an initial assessment for occupational deafness is provisional for five years, with automatic reassessment. Permanent work-related noise-induced hearing loss neither improves nor deteriorates after ceasing the noisy occupation. Hearing will continue to worsen due to age but there is no evidence that the worsening is caused or increased by prior noise exposure so long as that exposure has ceased (11).

**We recommend that all initial assessments for disablement levels arising from occupational deafness should be final and for life. This recommendation does not mean that a person's disablement assessment can never be revised if there is further disabling occupational noise exposure, but initial assessment should hold good for the long-term.**

### *“Aggregation”*

78. Occupational deafness is the only prescribed disease where an assessment for disablement below the lowest level at which payment is normally made (ie 14%) cannot be aggregated with similar low levels of assessment for disablement resulting from occupational accidents or other disease to a level at which payment is made (14% or more). For occupational deafness the lowest percentage assessed is currently 20%. Below this level of disablement there is, therefore, no percentage assessment available for aggregation to a level at which payment is made.

79. As with lowering of the compensation threshold, we have considerable sympathy with the argument that in principle occupational deafness should be treated in the same way as the other prescribed diseases, particularly because there are certain occupations where different disabling diseases or conditions can be contracted through the same work process - e.g. the use of pneumatic percussive tools can put a person at risk of hearing loss and vibration white finger.

80. Aggregation has not been thought appropriate in the past because where the threshold is met, the scheme takes into account all hearing loss. Put simply, although the initial hurdle for award to be paid in occupational deafness is high, once it is met the Scheme is generous. There is intrinsic uncertainty in audiological measurement of up to 10 dBs even in skilled hands, with an unspecified component due to age and other non-occupational causes such that at lower levels of hearing loss there is less confidence in the ability to presume an occupational cause.

**We conclude that on balance, current evidence does not yet provide sufficient basis for recommendation of aggregation, at levels of disablement for occupational deafness of less than 20%.**

### **Interaction**

81. Various papers have considered the association between vibration (Vibration White Finger (VWF) / Hand Arm Vibration Syndrome (HAVS)) and noise-induced hearing loss. (25, 26, 27). The results in general suggested that when exposed to noise, those with VWF/HAVS develop more hearing loss than those without VWF/HAVS.

82. The limitations of these investigations included small study size and the fact that they involved very high noise and vibration. The researchers themselves were generally cautious in presenting results and identified as limitations possible differences in noise and vibration levels from the individual tools used during the study period, and differences in risks for individuals, dependent upon variation in tool handling practice. The pathological basis of the observations remains unclear. Various hypotheses involving sympathetic neuro-stimulation in people with VWF leading to vasoconstriction in the inner ear and hence ischaemia of the cochlear cells have been proposed. However, to date empirical supporting evidence is lacking.

83. Other work which we reviewed showed in both men and women an association between hearing difficulty and cold induced finger blanching. Interestingly, this was observed even in those who had never been importantly exposed to noise at work or to hand transmitted vibration. The relationship between noise stimulus and cochlear blood flow (CBF) is not straightforward, and the basis of differences observed between noise-induced hearing loss in those with and without VWF is unknown.

84. The Council is aware of evidence suggesting that exposure to certain chemicals might affect hearing and of preliminary work on rodents and humans which suggests that, in an occupational setting, there might be interaction between noise and chemical substances (28, 29). There is

evidence that lead, mercury, carbon monoxide, toluene, styrene, trichloroethylene, xylene and n-hexane may be ototoxic in humans. However, it remains to be established how these substances might cause loss of auditory function, and how they might affect noise-induced hearing loss.

**We conclude that the emerging evidence on interaction is interesting. The Council will continue to monitor this topic.**

### **Gaps in knowledge and future research**

85. Critical evaluation of the literature and discussion with experts from the UK and overseas from the relevant disciplines has confirmed that there remain significant gaps in our understanding. It is apparent that there is marked constitutional variation in hearing in normal people as well as in susceptibility to noise and ageing. As a person is occupationally noise-exposed, so too is he ageing, and noise and age confound one another. There are also technical challenges in diagnosis of noise-induced hearing loss and in noise dose estimation. There are as yet no published data linking measured noise dose to measured hearing threshold level.

86. Ideally the compensation threshold for occupational deafness should be in line with that for the other prescribed diseases, and similarly aggregation of levels of disablement below the compensation threshold should be permitted. We are unable, however, to make such recommendations because of the limitations of present evidence. Our review of the published peer-reviewed literature and of new work has not identified robust evidence of doubling of risk that a disablement level of sensorineural hearing loss - either 50 dB average or 44 dB averaged over 1, 2 or 3 kHz can result from a given occupational noise dose. We believe that the preliminary work discussed at paragraphs 73 et seq is of considerable interest and should be extended, using a similar but quantitative approach.

**We recommend that emerging research on the topic should be carefully scrutinised and that the prescription of occupational deafness and its terms should be kept under review.**

## **4: OCCUPATIONAL COVERAGE**

### **Background: Changes in Industrial practice and standards**

87. As indicated above, there have been fundamental changes to industry since prescription of occupational deafness was introduced. There is less industry now which is obviously noisy and a much greater emphasis on prevention, both by modification of processes and provision of personal protection. Safety standards are higher, regulation more effective, and hearing protection of workers and shielding of noisy machinery should have improved matters. While the incidence of occupational deafness should therefore be declining, there is an in-built time lag. Risk depends on cumulative, and not only recent, exposure.

### **Consultation document**

88. The Council issued a consultation document in August 1998 asking for comment and evidence about the occupations covered for occupational deafness and whether changes were needed.

### **Responses**

89. Submissions were received from eleven individuals and organisations including the Trades Union Congress, the Royal National Institute for Deaf people, the Confederation of British Industry and the Society of Occupational Medicine.

90. The TUC submission considered that a system of individual proof should operate for this disease, so that anyone who could provide evidence of a work history including exposure to noise at a level sufficient to cause hearing damage should be paid unless there was evidence to suggest the damage had been induced by non occupational causes. Alternatively, an 'open' category (as exists for the prescription of occupational asthma) could be used so that workers in jobs other than those in the list could still make a claim successfully if they could provide evidence to satisfy the decision-maker. However, most overall support was for continuing the present system of prescribing by occupation and process, and it was noted that the Noise at Work Regulations only require employers to keep current records and do not require retention of old records. A number of people who replied supported prescription in principle on the grounds of measured level of noise exposure but recognised that there are insufficient long-term records to support it, and therefore it was impractical.

91. Suggestions were made by many respondents on the basis of their experience for adding new occupations to the prescribed list, although very little scientific or epidemiological evidence was submitted to the Occupational Deafness Working Group to support these suggestions. The following occupations were suggested for consideration:

- Workers in boning units in a meat processing factory
- Workers in 'call' centres
- Sound engineers, technicians and mixers
- Print workers
- Film, broadcasting and telecommunications workers



- Workers in music clubs and dance clubs
- Pulp manufacturers
- Workers using firearms, e.g. gamekeepers
- Workers in the vicinity of spot-welding machines

92. Because no evidence was put forward indicating the doses of noise to which workers in these jobs were generally exposed, the Council would particularly welcome any data recording measured noise levels in these jobs to allow comparison with occupations already prescribed. These should ideally be in similar terms to that used in 1988 by the special adviser to the Council, Mr Stoker and set out in the Council's report 'Occupational deafness' (Cm 817). Leq (8 hr) is the equivalent continuous sound level over a working day normalised to an 8 hour exposure. The special adviser studied occupations and processes at first hand, ascertained work patterns and made acoustic measurements to determine values of Leq (8 hr). The occupations and processes studied were those where best information indicated they involved high noise levels, ie 98dB(A) and above and with regular sustained exposure. Further occupations and industries were selected on the basis of recommendations received from individuals, Trades Unions and employers' organisations, and of preliminary studies conducted by the special adviser. If it transpired that noise levels in the proposed occupations were as high as those for those currently prescribed, the Council's Occupational Deafness Working Group (ODWG) would be in a position to consider and frame objective evidence-based recommendations to the Secretary of State.

***Further sources of information***

93. The Council has considered evidence and information from a range of sources, including:

- information provided by the two population based surveys of self-reported work-related illnesses undertaken by HSE in 1990 and 1995 and a complementary survey of self-reported working conditions in 1995; similar surveys undertaken by the European Foundation for the Improvement of Living and Working Conditions; and a survey of establishments with five or more employees undertaken for a cost benefit analysis of the Noise at Work Regulations 1989;
- evidence from the Occupational Disease Intelligence Network (ODIN) co-ordinated by the University of Manchester;
- suggestions made by MPs in correspondence with the Council; and
- literature searches on occupational categories at risk.

***Possible additions to the list of prescribed diseases***

94. Evidence was received from the HSE that police firearms training officers and shot blasters were in occupations where the level of exposure to noise was at least as high as in the occupations already prescribed.

**We recommend that the following occupations should be added to the list of prescribed occupations for occupational deafness:**

- Police firearms training officers
- Shot blasters involved in cleaning with abrasives carried in air.

## Occupations and processes currently prescribed

95. We have had no evidence that any of the occupations and processes already prescribed have disappeared, ceased to be a hazard to hearing, or fundamentally altered to the extent that their removal from the list would be appropriate. No one responding to the consultation paper suggested that specific occupations should be removed from the current list.

## Clarification of certain Prescribed Occupations

96. From representations received, and where raised in other ways - for example in Social Security Commissioner's decisions - **we have considered whether the wording of a number of the existing prescribed occupations could be amended to clarify their scope**, namely:

- water-jetting
- work in forestry
- forging
- mechanical bobbin cleaning
- work using or in the vicinity of band-saws
- high-speed false twisting in the knitting industry.

### *Water-jetting*

97. The current prescription refers to the 'water-jetting industry', and it has become apparent that this phrase has caused some difficulties for decision-makers. Water-jetting can be carried out in a variety of ways and contexts and at very different pressures some of which would certainly pose a noise hazard but others would not. There is a need to clarify that the Council intended to include only those water-jetting processes using high pressure on a commercial basis and where an employee would be put at regular and frequent risk of exposure to high levels of noise likely to damage hearing.

98. Evidence was taken from HSE experts on the level of pressure that would be likely to be hazardous to hearing and produce disablement. We understand that such pressures are likely to be substantially and regularly reached in processes routinely performed by specialist operators. Accordingly, we recommend that water-jetting operations undertaken at pressures above 10,000 psi should be prescribed within the benefit scheme, and that the current reference to 'industry' should be omitted from the prescription.

### *Forestry*

99. There is a need to clarify the meaning of the word 'forestry' in the regulations for both occupational deafness and prescribed disease A11 Vibration White Finger. Following Social Security Commissioners' decisions expressing conflicting views, a Court of Appeal judgement held that the phrase "regular use of chainsaws in forestry" should not be given a narrow definition. The words "in forestry" meant "the management of growing timber" and were not restricted to work in commercial forestry.

100. In deciding whether prescription is satisfied another important consideration is the duration of use of the chainsaw. To date, the Council has seen no evidence from any source to indicate that occupations where chainsaws may be used for varying, perhaps seasonal, periods posed a risk to hearing. The Council will of course monitor research in this area, and would be particularly interested in research that indicated exposure levels in any occupations using chainsaws might result in noise exposure levels close to the relevant Leq (8hr). An alternative approach considered was to set out in regulations the type, size and power of chainsaws, and specify in detail the time usage of these tools. However this approach would be quickly out of date and would produce inequities of approach.

**We recommend that the prescription should be amended to the “regular use of chainsaws”.**

### *Forging*

101. We also considered whether the term “forging” needed to be clarified, but decided that forging was an understandable term with a definite meaning in industry and should be retained unqualified.

### *Weaving/knitting*

102. Certain processes in the weaving industry are currently prescribed, and there has been some debate about whether the process of high-speed false twisting in the knitting industry should also be included. Some evidence indicated that high speed false twisting was not a process used in the knitting industry. However, the Council received other evidence that high speed false twisting is a process that can take place prior to both knitting and weaving, and produces yarn for both of these areas of fabric manufacture.

**We recommend that high speed false twisting should be prescribed where this process occurs prior to either knitting or weaving.**

### *Mechanical Bobbin Cleaning*

103. Representations had been made to the Council that the current prescription regarding mechanical bobbin cleaning could be misleading. The intention is that the cleaning of bobbins by mechanical means should be prescribed, rather than the cleaning of mechanical bobbins. We recommend that the wording of the regulations (prescribed disease A10 sub paragraph) should be revised to make this intention clear.

### *The use of band-saws*

104. A question has arisen about the accuracy of the wording of the current prescription in relation to circular saws and the working of wood (paragraph h). Advice from the HSE has been received that indicates the paragraph should be reworded to achieve the original intention and remove possible misunderstanding.

We recommend that this paragraph is reworded as follows (change noted in italics): “the use of, or work wholly or mainly in the immediate vicinity of, any of the following machines engaged in working of wood, that is to say: multi-cutter moulding machines, planing machines, automatic or semi-automatic lathes, multiple cross-cut machines, automatic shaping machines, double-end tenoning machines, vertical spindle moulding machines (including high speed routing machines), edge banding machines, band-sawing machines with a blade width of not less than 75 millimetres and *all circular sawing machines including those operated by moving the blade towards the material cut; or*”

### **Simplification of the present list - proposed re-grouping**

105. It is important that the list of occupations should be as simple as possible to understand and straightforward to administer. The list of occupations is by far the longest within the schedule of diseases, and we have borne in mind that a re-structuring of the occupations may aid clarification. We recommend that the occupations should be regrouped as in Appendix 4.

### **Future approach to occupational coverage of the scheme**

106. In an ideal world, records of each individual’s noise exposure would be available for use in a benefit scheme or civil litigation. However, it is highly unlikely that these will ever become available in a reliable form for all employed earners and the use of occupational categories remains the most practicable way to achieve a prescription that will support those most at risk of harmful exposure.

107. We considered the possibility of adding a ‘catch-all’ category at the end of the list of occupations to include workplaces where noise immission levels were available. Major difficulties with this approach are the inconsistency and variable quality of noise recording at different workplaces. This could lead to unfairness for those who worked where no, or incomplete records were kept. Another difficulty is knowing the duration of high or low exposures. A catch-all category would also add a provision that would complicate the benefit scheme unnecessarily and be unwieldy to administer.

108. The Council has asked the HSE to monitor occupations against the criteria used by the Council’s Special Adviser in the past and bring results once a year to the Council’s Research Working Group. HSE would examine any representations made to IIAC about occupations that may be suitable for prescription on this basis and also any occupations that may come to the HSE’s notice by other means. This should ensure a more systematic review of the list of prescribed occupations and possible amendments.

### **Future monitoring arrangements**

109. The Council will continue to monitor developments regarding occupational deafness in connection with new occupations. New jobs within the developing service industries need to be carefully watched and may involve harmful exposure to noise - for instance motor-cycle couriers, sound engineers and jobs in call centres. The Council welcomes any new research into the dangers of noise in industries or occupations where the risks may not be understood or taken into account. The Council will refer to the HSE on a yearly basis any cases that have come to the attention of the Council.

## 5. TINNITUS

110. Tinnitus is a common symptom in the adult population occurring at some time in about 30% of adults and increasing in prevalence with age. Noise is a common cause of tinnitus, but it can result from other causes. Tinnitus which starts more than a year after exposure to noise has ceased is unlikely to be due to noise. Tinnitus is subjective, and cannot yet be objectively measured; it may be intermittent or improve over time. (30). Recent evidence suggests that tinnitus has little effect on the ability to hear in everyday life (31, 32). [If hearing threshold is plotted against speech audiometry the scatter is the same in the presence or absence of tinnitus.]

### **Treatment of tinnitus within the current UK benefit scheme**

111. There is no standard test for the existence of tinnitus or to measure its disabling effect. There have been attempts, using matching and masking techniques and synthesizers, to assess tinnitus pitch, bandwidth, loudness and maskability. Unfortunately, these have produced only spurious results. Under present arrangements for assessing the level of disablement for prescribed disease A10, discretion exists to allow the decision maker, on the basis of clinical judgement of a medical adviser, to increase the disablement assessment to reflect the effects of tinnitus. The severity of tinnitus can only be assessed by a detailed history from the claimant using non-directive questions. Details of the approximate date of onset, how often tinnitus is present, whether it interferes with sleep or concentration, whether the patient has sought medical advice etc, all assist in determining the severity of the tinnitus in the individual. Severe tinnitus, ie in a case where it has been present for 2 or more years; is constant and interferes with concentration and the ability to carry out normal social and occupational activities; causes disturbance of sleep pattern; and there is evidence that treatment has been sought (e.g. maskers, and/ or medication to control sleep etc), is likely to increase the amount of disablement resulting from noise-induced deafness by the order of 5% or 6%.

### **Treatment of tinnitus in other compensation schemes**

112. Reflecting the uncertainties, there is no international consensus approach to tinnitus in compensation schemes or the Courts. Indeed, because of its subjective nature, some schemes simply decline to compensate tinnitus, for example workers' compensation schemes in some American States and Canada. Others recognise the effects of tinnitus by giving a notional flat rate addition to the assessment where tinnitus accompanies a level of noise-induced hearing loss for which compensation is payable (e.g. in Australia where an additional 5% can be allowed). In schemes which allow a variable addition to an assessment of hearing disablement the addition is usually low e.g. in Germany where tinnitus accompanying compensatable noise-induced sensorineural hearing loss can attract an additional 2.5 -10%. In the USA, the US Department of Veterans Affairs Guidelines sets out six criteria required before tinnitus can be recognised:

- the claim must be unsolicited;
- for compensation to be paid there must be a compensatable degree of hearing loss;

- there must have been an attempt to treat the tinnitus before the claim - e.g. through counselling, or drugs or hearing devices;
- there must be evidence to support personality change/sleep disorders;
- there must be no history of substance abuse or use of therapeutic drugs, and
- any complaint of tinnitus must be substantiated by family or someone described as a “significant” other.

113. A new system of hearing disability assessment has recently been proposed in Ireland (33). This recommends that compensation should be paid for tinnitus only where evidence confirms that it occurs for 50% of the time and has existed for two years. Onset must also have close time relation to the hearing loss and the complaint should be medically documented prior to the benefit claim. Suggested assessment additions are mild tinnitus nil %; moderate 2% and severe 6%.

114. Under the provisions of the UK War Pensions scheme tinnitus is not considered as a stand-alone disablement, although in similar fashion to the Industrial Injuries Benefit scheme it may be included as part of noise-induced sensorineural hearing loss. If a war pension is awarded for noise-induced hearing loss an additional element for tinnitus may be added to the award.

## **Recommendations**

**We cannot support the prescription of tinnitus as a stand-alone disorder because it is a subjective symptom and there is no objective method of assessment. Tinnitus should, however, continue to be taken into account in assessment. We also recommend that written guidance on tinnitus and its assessment should be provided to doctors who advise decision-makers in the Scheme.**

## **6. SERVICE DELIVERY ISSUES**

### **Claims process**

115. The process used to decide claims is outlined in Appendix 3. In 1999 changes to the decision making and appeals process saw the end to medical adjudication. Responsibility for deciding medical questions in connection with claims for industrial injuries benefits moved from doctors to decision-makers in local offices. Decision-makers do, however, have access to doctors who provide advice on diagnosis, loss of faculty and level of disablement. This is an advisory role: it is for the decision maker to decide entitlement taking into account this advice and any other medical evidence supplied by the claimant. The Council submitted views prior to the new arrangements coming into force and will be monitoring their operation generally.

116. Recommendations made in earlier IIAC reports were reviewed by the Occupational Deafness Working Group and the suggestions on service delivery matters were re-evaluated. In general terms the service delivery and administrative difficulties that faced the prescription of this disease have been overcome and processes put in place that manage current loads effectively. In particular, we understand that long delays in certain areas of the country in assessing claims no longer occur.

### **Audiometric testing**

117. We considered the relative merits of Pure Tone Audiometry (PTA) and Evoked Response Audiometry (ERA) for diagnostic purposes and the assessment of disablement. A number of experts were asked for their views and in general they were of the opinion that PTA undertaken to quality assured standards remained the most appropriate first line method for diagnosis and assessment of occupational deafness. Where the audiometrician considered this test unreliable, unrepeatable or in some other way unrepresentative of true hearing ability, they recommended the more objective cortical evoked response audiometry (cERA) (34). In this regard it is noted that several of the experts consulted in the review expressed the view that a significant percentage of pure tone audiometry tests recording a hearing loss of 50 dB averaged over 1, 2 and 3 kHz were likely to be over-estimates.

**We recommend that the procedures for performing pure tone audiometry remain the same as are currently in use ie:**

- Audiometry should be performed by a qualified audiometrician;
- The audiometrician should ask for proof of identity and indicate in the report, that they have seen this;
- Audiometry should only be performed if it is more than 12 hours since the last exposure to loud noise, including loud social noise. It is recognised that the effect of temporary threshold shift exceeds 12 hours and ideally a longer period is called for. However claimants may still be in employment and hence it is not practical to extend the current period during which they should not be exposed to loud noise;

- The claimant should be required to sign a declaration that he/ she has not been exposed to loud noise in the previous 12 hours;
- Audiometry should be performed on an audiometer that has been calibrated within the previous 12 months;
- Even though it is the hearing level at 1, 2 and 3 kHz which is used to diagnose prescribed disease A10, the audiogram should record responses from 500Hz to 8kHz and up to 110dB if necessary in order that the pattern of the audiogram can be seen;
- If the air conduction tests show a hearing loss of at least 50dB averaged over 1, 2 and 3kHz, then bone conduction tests should be carried out;
- On completion of the test the audiometrician should comment on how precise and repeatable were the claimant's responses to testing;
- If testing is not precise or repeatable, or responses to conversational voice seem better than the audiogram would suggest, consideration should be given to obtaining further tests e.g. evoked response audiometry; and
- To calculate the average sensorineural hearing loss over 1, 2 and 3 kHz, bone conduction thresholds should be used if there is an appreciable conductive element in the hearing loss ie an air/bone gap of more than 10dB when averaged over 1, 2 and 3kHz.

Pure tone audiometry (PTA) remains appropriate for use in the benefit scheme. The present system works well: the audiometricians have to be qualified and properly trained before their services are used. They also work to specified technical standards in respect of audiometers and transducers used, calibration and background noise criteria, and use of standard audiometric procedures. Arising from this review we note that the Corporate Medical Group of the Department for Work and Pensions have drawn up new guidance (see Appendix 6) on the circumstances in which cERA may be appropriate to supplement PTA tests.

**It is appreciated that technical aspects of hearing loss assessment remain the subject of research interest. We recommend that the potential use of other methods of testing hearing loss should be kept under review.**

## **Leaflets and forms**

118. As part of an overall project for improving communications with the public, the Benefits Agency (from 1 April 2002 Jobcentre Plus) reviewed existing industrial injuries leaflets. In November 1999 this review led to the replacement of existing leaflets by two leaflets:

SD6: Ill or disabled because of a disease or deafness caused by work.

SD7: Disabled because of an accident at work

119. In addition a new publication, the Industrial Injuries Technical Guide was also introduced aimed at providing claimant advisory bodies with an outline of the industrial injuries scheme, its entitlement conditions and administrative processes. A further comprehensive review of letters issued is underway, known as the "Better Letters project". The first set of improved letters, which covered bereavement only, were issued in Spring 2001, with the rest issued in September 2001.



**We recommend further review of forms and leaflets in light of any changes to the Scheme following publication of this report.**

## **Take -Up**

120. The Council received evidence from the Welfare Rights Unit of Lancashire County Council and from the Royal National Institute for Deaf People (RNID) about the problems caused to claimants who had been unaware of their eligibility to claim benefits under the scheme until they had been out of an eligible occupation for more than five years. The Council reaffirmed its belief that benefit must be claimed within five years of leaving the occupation that has caused the hearing loss. The reason for the 5-year time limit is that, beyond that time, it would not be possible, on the balance of probabilities, to assume that the hearing loss was due to that occupation. But we sympathised with the feelings of injustice expressed on behalf of those who had failed to claim simply because of lack of awareness of the rather restricted list of occupations prescribed under the scheme.

**The Council recommends the Government takes steps to ensure that potential claimants are aware as early as possible of their eligibility and the need to claim within five years of leaving a noisy occupation. This might be done by promoting awareness in audiology clinics (and in associated healthcare settings) or by assisting or encouraging unions and/or employers in the relevant industries to spread awareness.**

## **Notifications of decisions**

121. We consider that it is important that people whose hearing loss is below the threshold when assessed for benefit purposes should not be given the impression when they receive the written decision from Jobcentre Plus that they are not suffering from impaired hearing. The point is that they do not qualify for benefit under the rules of the benefit scheme, which is not the same as saying that they have no hearing impairment at all. Recent changes made to the decision notifications by Jobcentre Plus have taken this point into account.

## **Other issues**

122. Occupational deafness does not at present feature on the RIDDOR<sup>3</sup> list of reportable diseases. It is possible that a future amendment to RIDDOR may include deafness and we would hope to be consulted if this were the case.

123. We consider that the approach to prescription for this disease is consistent as far as is practical with the European Commissions (EC) EU recommended schedule<sup>4</sup>. The EU schedule lists 'hypoacusis or deafness caused by noise' as an occupational disease.

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<sup>3</sup> RIDDOR The Reporting of Injuries, Diseases and Dangerous Occurrences regulations were enacted in 1985. These require employers to report to HSE/ local authorities all serious accidents at work and cases of the specified diseases. The regulations contain a list of reportable diseases.

<sup>4</sup> In May 1990 the EC proposed a recommendation (90/ 326 EEC) concerning the adoption of a European schedule of occupational diseases.

## **Prevention**

124. The risk of occupational noise-induced hearing loss (NIHL) can be minimised by good working practices and the introduction of control measures to reduce the exposure of workers to loud noise. Employers have a legal responsibility under the Noise at Work Regulations 1989 to reduce the risk of hearing damage to employees.

125. The most reliable way of limiting exposure is to reduce the noise levels in the workplace, for example by obtaining quieter machinery, introducing engineering controls or using a different or quieter work practice.

126. Where it is not possible to reduce the noise level the exposure of employees to loud noise can be reduced by, for example, limiting the time spent in noisy areas or providing a noise refuge. The use of ear protection is a last resort to control noise exposure.

127. Employees who are regularly exposed, or likely to be exposed, to loud noise at work should undergo regular health surveillance (audiometry) to monitor the effects of noise exposure on their hearing, including an audiogram before starting work. The Council is aware that there are proposals for health surveillance to cover workers exposed to lower levels of noise than currently prescribed in Regulations. Such evidence would inform future reviews of occupational deafness.

128. The Health and Safety Executive has published guidance on the Noise at Work Regulations 1989 entitled “Reducing noise at work” (L108).

## **7. CONCLUSIONS, SPECIFIC RECOMMENDATIONS, AREAS FOR FURTHER RESEARCH**

### **Conclusions**

129. The remit of the review was to confirm that the statutory requirements for prescription continue to be satisfied, to identify any amendments required to ensure they reflect current scientific knowledge, to identify measures to improve the speed and ease of processing claims and reduce the administrative cost of identifying and paying those entitled to benefit, and to review the effectiveness of benefits, given the different circumstances of people with different prescribed diseases.

130. The review of occupational deafness has examined scientific evidence emerging since 1975 which might inform a recommendation about compensation threshold and aggregation. Evaluation of this evidence has confirmed that although research of high quality has been reported, there remain significant gaps in the areas investigated. In particular, there is a lack of peer-reviewed published work on the relationship between occupational noise exposure and resultant sensorineural hearing loss. Because the advice of the Council is circumscribed by available scientific evidence these gaps have limited the present scope for recommendation for change on compensation threshold and aggregation.

131. The Council concludes that:

- The current method of diagnosis of occupational deafness should continue to be used.
- The five and ten year rules should remain in place.
- The current method of assessment (ie the use of pure tone audiometry (PTA) at 1, 2 and 3 kHz should be retained.
- The current DWP scale linking hearing threshold level to disablement should be retained.
- No change should be made to current arrangements which do not normally make an offset for conductive hearing loss.
- Similarly there should be no offset for ageing.
- On present evidence awards should continue to become payable at 20% disablement, 50 dB bilateral hearing loss averaged over 1, 2 and 3 kHz.
- All initial assessments should be final and for life. This recommendation does not mean that a person's disablement assessment can never be revised if there is further disabling occupational noise exposure, but initial assessment should hold good for the long-term.
- On present evidence aggregation cannot be recommended except where normal requirements for prescription are met.
- The emerging evidence on interaction is interesting and the Council will continue to monitor this.
- Scrutiny of emerging research will continue and the prescription of occupational deafness and its terms will remain under review.
- The wording of a number of existing prescribed occupations should be amended to clarify their scope and a revised grouping of prescribed occupation should be introduced.

- Work as police firearms training officers and shotblasters using abrasives carried in air should be added to the list.
- The prescription of tinnitus as a stand-alone disorder cannot be supported because it is a subjective symptom and there is no objective method of assessment. Tinnitus should, however, continue to be taken into account in assessment. Written guidance on tinnitus and its assessment should be provided to doctors who advise decision-makers in the Scheme.
- It is appreciated that technical aspects of hearing loss assessment remain the subject of research interest. We recommend that the potential use of other methods of testing hearing loss should be kept under review.
- The Government should take steps to raise awareness of eligibility amongst potential claimants.
- Further review of forms and leaflets in light of any changes to the Scheme following publication of this report.

### **Specific recommendations**

132. The Council recommends that:

- The occupations prescribed for prescribed disease A10 should be amended. The aim would be to focus on work patterns/ circumstances likely to lead to sufficient noise exposure to cause noise-induced hearing loss rather than merely use of the tools and techniques incidental to the employment. Suggested amendment is informed by expert evidence, including from the Health and Safety Executive. Specific changes relate to:
  - water-jetting - to focus on water-jetting operations undertaken at pressures above 10,000 psi (or 680 bar) for water-jets or a mixture of water and abrasive material in the water-jetting industry (including similar work under water).
  - forestry - to clarify that following Court of Appeal judgement the word “forestry” is not restricted to work in the forestry industry.
  - mechanical bobbin cleaning - it needs to be made clear that the mechanical means of cleaning bobbins is prescribed, not the cleaning of mechanical bobbins.
  - high speed false twisting - the intention is to include this process when it takes place prior to knitting/weaving.
  - band-saws - the wording of this paragraph needs to be amended to reflect more properly the range of wood-working machines which should be covered.
- work as police firearms training officers and shot-blasters should be added to the list of prescribed occupations.

133. The current approach to assessment of occupational deafness and the present disablement scale should continue to be used.

134. Pure tone audiometry (pta) should be retained as the most appropriate routine assessment method for use in the benefit scheme. Where testing is not repeatable, or response to conversational voice seems better or worse than the audiogram would suggest, use of cERA should be considered.

135. The forms issued to employers in relation to claims for this disease, and the notification letters issued to claimants, should be reviewed by Jobcentre Plus to ensure they are straightforward to complete.

136. A revised grouping of prescribed occupations should be introduced.

137. The rule that a person must claim within five years of leaving one of the prescribed noisy occupations, and that they must have worked in at least one of those occupations for at least ten years, should remain in place;

138. Initial assessments for occupational deafness should normally be final [although a person who continues to fulfill the occupational requirement may ask for review at a future date, and the possibility of the claim being reviewed if circumstances change is not precluded].

139. People whose hearing loss is below the threshold when assessed for benefit purposes should not be given the impression when they receive the written decision from Jobcentre Plus that they are not suffering from impaired hearing. The point is that they do not qualify for benefit under the rules of the benefit scheme, which is not the same as saying that they have no hearing impairment at all. Recent changes made to the decision notifications by Jobcentre Plus have taken this point into account.

140. No changes should be made to the current methods of identifying and assessing pre-existing deafness.

141. It remains inappropriate to introduce an off-set for conductive hearing loss.

142. Revised guidance on tinnitus assessment in the Scheme should be issued to doctors advising Jobcentre Plus decision-makers

143. The threshold for compensation should be maintained at 50dB bilateral hearing loss, averaged over 1, 2, 3 kHz .

144. Current evidence does not yet provide sufficient basis for recommendation of aggregation, except where the normal requirements for prescription are met.

145. Scientific and other relevant developments which might impact on prescription should be kept under regular review.

## **Areas for further research**

146. For occupational deafness, awards become payable at 20% disablement: at 50 dB averaged over 1, 2 and 3 kHz. This contrasts with most other prescribed diseases where payment is made from 14% disablement, and in the case of pneumoconiosis and byssinosis, from 1%. It has always been recognised that the prescribed disease A10 definition sets a high threshold for award to be paid. Using the DWP scale, 14% disablement would be equivalent to a threshold of 44 dB.

147. In logic and fairness the threshold for payment of benefit in cases of work related noise induced hearing loss should be in line with the other prescribed diseases.

148. Recommendations of the Council on prescription must, however, be based on evidence of high quality.

149. Occupational deafness was originally prescribed before adoption of the Council's current approach to prescription set out at paragraphs 15-20. The doubling of risk approach has usually been applied to discrete disorders which are easily diagnosed and evidently either present or absent. Occupational deafness is different in being a level of sensorineural hearing loss.

150. The Council faced a similar dilemma when considering the prescription of chronic bronchitis and emphysema in coal miners. At the time of the 1973 report (Cmnd 5443) the Council concluded that there was insufficient evidence for prescription. But by 1992 new research which provided the scientific basis for prescription had been published.

151. For occupational deafness present evidence does not support revision of the prescription. Objective demonstration of a doubling of risk of attaining 44 dB hearing loss following exposure to a known noise dose would form grounds for recommendation on a revised threshold. The Council recommends that the study discussed at paragraph 73-75 above (25) be extended using a similar approach but with measured cumulative noise dose and hearing threshold levels.

**APPENDIX 1.**  
**CURRENT TERMS OF PRESCRIPTION FOR**  
**OCCUPATIONAL DEAFNESS**  
**PRESCRIBED DISEASE A10**

<p><b>Prescribed disease or injury</b></p> <p><b>A10. Occupational deafness. Sensorineural hearing loss</b> amounting to at least 50 dB in each ear, being the average of hearing losses at 1, 2 and 3 kHz frequencies and being due in the case of at least one ear to occupational noise.</p>	<p><b>Any occupations involving</b></p> <p>(a) The use of powered (but not hand powered) grinding tools on metal (other than sheet metal or plate metal), or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(b) the use of pneumatic percussive tools on metal, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(c) the use of pneumatic percussive tools for drilling rock in quarries or underground or in mining coal or in sinking shafts or for tunnelling in civil engineering works, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(ca) the use of pneumatic percussive tools on stone in quarry works, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(d) work wholly or mainly in the immediate vicinity of plant (excluding power press plant) engaged in the forging (including drop stamping) of metal by means of closed or open dies or drop hammers; or</p> <p>(e) work in textile manufacturing where the work is undertaken wholly or mainly in rooms or sheds in which there are machines engaged in weaving man-made or natural (including mineral) fibres or in the high speed false twisting of fibres; or</p> <p>(f) the use of, or work wholly or mainly in the immediate vicinity of, machines engaged in cutting, shaping or cleaning metal nails; or</p> <p>(g) the use of, or work wholly or mainly in the immediate vicinity of, plasma spray guns engaged in the deposition of metal; or</p>
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	<p>(h) the use of, or work wholly or mainly in the immediate vicinity of, any of the following machines engaged in working of wood, that is to say: multi-cutter moulding machines, planing machines, automatic or semi-automatic lathes, multiple cross-cut machines, automatic shaping machines, double-end tenoning machines, vertical spindle moulding machines (including speed routing machines), edge banding machines, band sawing machines with a blade width of not less than 75 millimetres and circular sawing machines in the operation of which the blade is moved towards the material being cut; or:</p> <p>(i) the use of chain saws in forestry; or</p> <p>(j) air arc gouging or work wholly or mainly in the immediate vicinity of air arc gouging; or</p> <p>(k) the use of band saws, circular saws or cutting discs for cutting metal in the metal founding or forging industries, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(l) the use of circular saws for cutting products in the manufacture of steel, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(m) the use of burners or torches for cutting or dressing steel based products, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</p> <p>(n) work wholly or mainly in the immediate vicinity of skid transfer banks; or</p> <p>(o) work wholly or mainly in the immediate vicinity of knock out and shake out grids in foundries; or</p> <p>(p) mechanical bobbin clearing or work wholly or mainly in the immediate vicinity of mechanical bobbin cleaning; or</p> <p>(q) the use of, or work wholly or mainly in the immediate vicinity of, vibrating metal moulding boxes in the concrete products industry; or</p>
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	<ul style="list-style-type: none"><li>(r) the use of, or work wholly or mainly in the immediate vicinity of, high pressure jets of water or a mixture of water and abrasive material in the water jetting industry (including work under water); or</li><li>(s) work in ships' engine rooms; or</li><li>(t) the use of circular saws for cutting concrete masonry blocks during manufacture, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</li><li>(u) burning stone in quarries by jet channelling processes, or work wholly or mainly in the immediate vicinity of such processes; or</li><li>(v) work on gas turbines in connection with:<ul style="list-style-type: none"><li>(i) performance testing on test bed;</li><li>(ii) installation testing of replacement engines in aircraft;</li><li>(iii) acceptance testing of Armed Service fixed wing combat planes; or</li></ul></li><li>(w) the use of, or work wholly or mainly in the immediate vicinity of:<ul style="list-style-type: none"><li>(i) machines for automatic moulding, automatic blow moulding or automatic glass pressing and forming machines used in the manufacture of glass containers or hollow ware;</li><li>(ii) spinning machines using compressed air to produce glass wool or mineral wool;</li><li>(iii) continuous glass toughening furnaces.</li></ul></li></ul>
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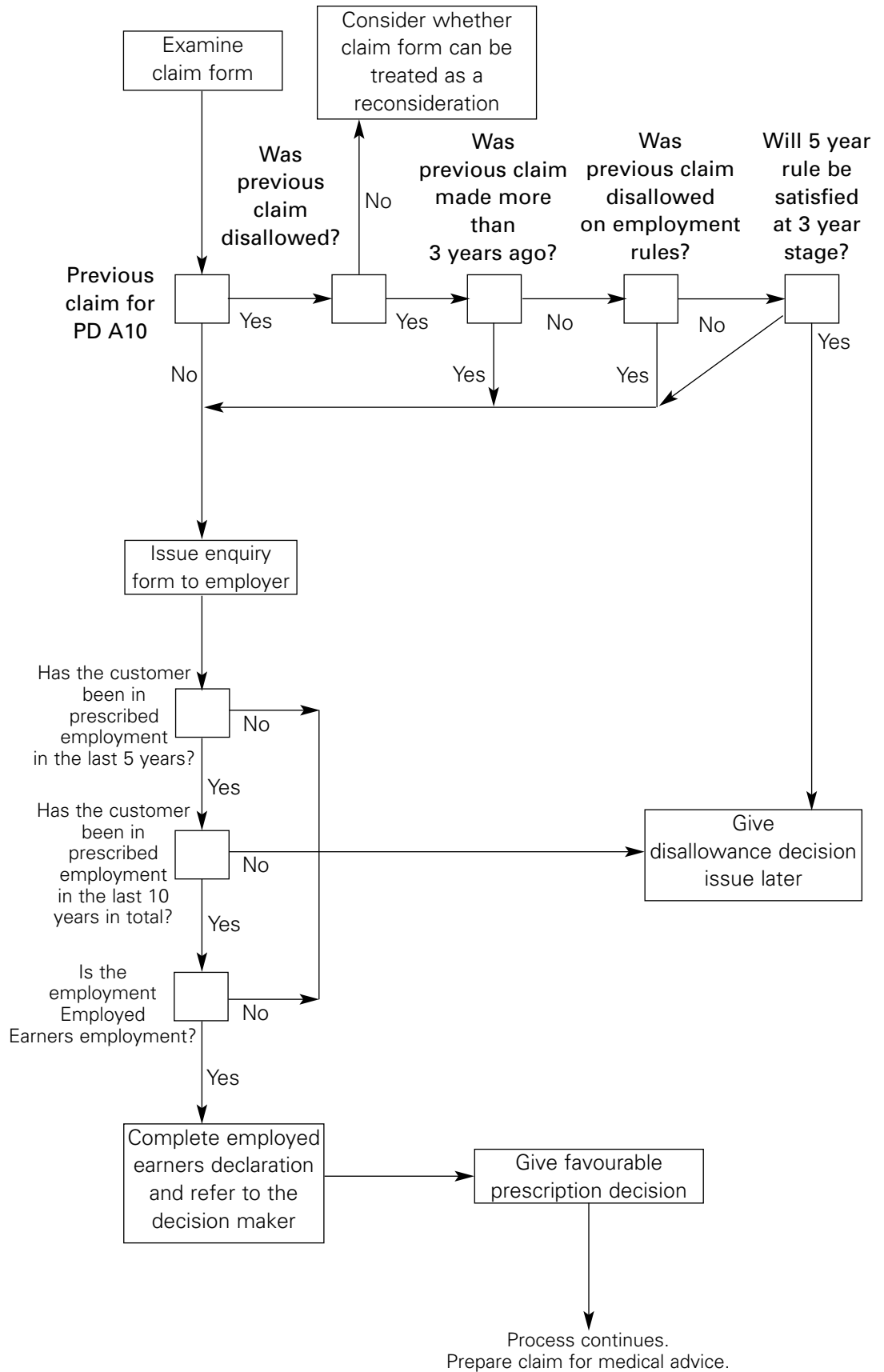
## APPENDIX 2.

### SHORT HISTORY OF THE PRESCRIPTION OF OCCUPATIONAL DEAFNESS

1. The Council has produced seven reports on occupational deafness. The first was entitled '**Industrial Noise and its Effect on hearing**' (Cmnd 4145) published in August 1969 in which the Council concluded that the link between industrial noise and deafness could be identified and that the issue should be thoroughly examined by the Council.
2. Occupational deafness was made a prescribed disease in 1975, following recommendations set out by the Council in their second report - '**Occupational Deafness**' (Cmnd 5461) - published in October 1973. This report recommended that:
  - 2.1 deafness should be prescribed when it is occupational, substantial, permanent and sensorineural;
  - 2.2 that certain jobs in the Metal Manufacturing and the Shipbuilding and Repairing Industries should be prescribed if a person had worked in them for at least 20 years and claims were made within one year of last working in the job;
  - 2.3 benefit should only be awarded where hearing loss in the better ear was 50dB or more averaged over the 1, 2 and 3kHz frequencies, and the date of development of the disease would be taken as the date of the successful claim;
  - 2.4 pure tone audiometry should be used to assess disablement; and assessments should be reviewed after five years;
  - 2.5 a presumption of occupational origin should be given [among employed earners in the prescribed occupation], and
  - 2.6 a correction for age-related hearing loss (presbycusis) should be made for people over 65 years old.
3. A third Council report - '**Occupational Deafness**' (Cmnd 7266) - was published in July 1978. Recommendations were that:
  - 3.1 occupational deafness was prescribed for sensorineural loss of at least 50dB in each ear where in one of them it was due to noise at work;
  - 3.2 a loss of 110dB should equal 100% disablement;
  - 3.3 extensions to the prescribed occupations should be made - to drilling with pneumatic percussive tools on metal, coal or rock, textile weaving sheds, textile texturing machines, nail manufacture and the use of plasma guns.
4. The fourth report - '**Occupational Deafness**' (Cmnd 8749) - was published in November 1982. Recommendations were that:
  - 4.1 The word 'permanent' should be dropped from the prescription, and all initial assessments should be provisional and last for five years;
  - 4.2 the time required to work in a prescribed job should be reduced from 20 years to 10 years, and claims must be made within 5 years of leaving the noisy job instead of 12 months;

- 4.3 the presbycusis offset should be abolished;
5. A variety of recommendations were made concerning audiological testing:
  - 5.1 benefit should be reduced if a claimant's hearing is found to have improved on reexamination;
  - 5.2 extensions to the prescribed occupations were made - high speed woodworking, chainsaws, and work "in the immediate vicinity" of prescribed processes should be included.
6. The fifth report - '**Occupational Deafness**' (Cm 817) - was published in November 1988. Recommendations were that:
  - 6.1 an offset (reduction) should be made to benefit to take into account the effect of non-occupationally caused deafness;
  - 6.2 various extensions to the prescribed occupations were made - including metal cutting, water-jetting, ships' engine rooms and others.
7. The sixth report - '**Occupational Deafness**' (Cm 1245) - was published in October 1990. The aim of the report was to examine possible ways of improving the administrative effectiveness of the occupational deafness scheme.
8. A seventh [unpublished] report was issued in July 1994 as a supplement to the fifth report (Cm 817 published in 1988) which recommended extensions to the prescribed occupations as follows - work in certain glass making processes and the use of hand-held pneumatic tools underground. The Government accepted these recommendations.

### APPENDIX 3. PROCESS CLAIM FOR OCCUPATIONAL DEAFNESS



\*Legislation that governs this is contained in the Social Security (Industrial Injuries) (Prescribed Diseases) Regulations 1985 in particular regulations 25 and 27

**APPENDIX 4.**  
**RECOMMENDED TERMS OF PRESCRIPTION FOR**  
**PRESCRIBED DISEASE A10**

<p><b>Prescribed disease or injury</b></p>	<p><b>Any occupation involving</b></p>
<p><b>A10. Occupational deafness. Sensorineural hearing loss</b> amounting to at least 50 dB in each ear, being the average of hearing losses at 1, 2 and 3 kHz frequencies and being due in the case of at least one ear to occupational noise.</p>	<p>(a) The use of the following tools, or work wholly or mainly in the immediate vicinity of those tools whilst they are being so used, or of the following processes:</p> <p>band saws, circular saws or cutting discs for cutting metal in the metal founding or forging industries, or circular saws for cutting products in the manufacture of steel, or powered (but not hand powered) grinding tools on metal (other than sheet metal or plate metal), or pneumatic percussive tools on metal; or</p> <p>air arc gouging, or burners or torches for cutting or dressing steel based products, or skid transfer banks, or knock out and shake out grids in foundries, or plant (excluding power press plant) engaged in the forging (including drop stamping) of metal by means of closed or open dies or drop hammers; or</p> <p>(machines engaged in cutting, shaping or cleaning metal nails, or plasma spray guns engaged in the deposition of metal; or</p> <p>(b) The use of pneumatic percussive tools for:</p> <ul style="list-style-type: none"> <li>- drilling rock in quarries; or</li> <li>- on stone in quarry works; or</li> <li>- underground; or</li> <li>- in mining coal; or</li> <li>- in sinking shafts; or</li> <li>- for tunnelling in civil engineering works; or</li> <li>- work wholly or mainly in the immediate vicinity of those tools whilst they are being so used; or</li> </ul> <p>(c) The use of, or work wholly or mainly in the immediate vicinity of:</p> <ul style="list-style-type: none"> <li>(i) vibrating metal moulding boxes in the concrete products industry; or</li> <li>(ii) the use of circular saws for cutting concrete masonry blocks during manufacture; or</li> </ul>

	<p>(d) Work in textile manufacturing where the work is undertaken wholly or mainly in rooms or sheds in which there are machines engaged in weaving man-made or natural (including mineral) fibres or in the high speed false twisting of fibres; or mechanical bobbin cleaning or work wholly or mainly in the immediate vicinity of mechanical bobbin cleaning; or</p> <p>(e) The use of, or work wholly or mainly in the immediate vicinity of, any of the following machines engaged in working of wood, that is to say: multi-cutter moulding machines, planing machines, automatic or semi-automatic lathes, multiple cross-cut machines, automatic shaping machines, double-end tenoning machines, vertical spindle moulding machines (including high speed routing machines), edge banding machines, bandsawing machines with a blade width of not less than 75 millimetres and circular sawing machines in the operation of which the blade is moved towards the material being cut; or the regular use of chain saws; or</p> <p>(f) The use of, or work wholly or mainly in the immediate vicinity of, high pressure jets of water or a mixture of water and abrasive material in the water jetting industry (including work under water); or burning stone in quarries by jet channelling processes; or</p> <p>(g) Work in ships' engine rooms; or work on gas turbines in connection with -</p> <ul style="list-style-type: none"> <li>(i) performance testing on test bed;</li> <li>(ii) installation testing of replacement engines in aircraft;</li> <li>(iii) acceptance testing of Armed Service fixed wing combat planes;</li> </ul> <p>or</p> <p>(h) The use of, or work wholly or mainly in the immediate vicinity of: machines for automatic moulding, automatic blow moulding or automatic glass pressing and forming machines used in the manufacture of glass containers or hollow ware; spinning machines using compressed air to produce glass wool or mineral wool; continuous glass toughening furnaces.</p>
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## **APPENDIX 5. EVIDENCE RECEIVED**

Evidence was received from:

Professor N Cherry  
Dr R R A Coles  
Dr B Dale  
Professor A Davis  
Dr J W P Hazell  
Mr B Lawton  
Professor M E Lutman  
Professor L Luxon  
Dr K T Palmer \*  
Professor D W Robinson  
Mr C Vize

Medical Members of the Panel of the Appeals Service

N C Bland  
T L Bradbeer  
I Hopper  
H F Marshal  
D B Mathias  
D Stewart Cameron

Organisations

Confederation of British Industry  
Lancashire County Council Welfare Rights  
Royal National Institute for Deaf People  
Society of Occupational Medicine  
Trades Union Congress

\* Dr Palmer gave evidence to the Council as an independent witness and prior to his becoming a member of the Council on 1st October 2001.

## **APPENDIX 6**

### **PRESCRIBED DISEASE A10 OCCUPATIONAL DEAFNESS:**

### **GUIDANCE ON OBTAINING CORTICAL EVOKED RESPONSE AUDIOMETRY (cERA)**

#### **Background**

In the light of the information that has been received during the review of PD A10 (Occupational deafness), IIAC has given advice about the circumstances in which it would be prudent for those advising decision-makers on the diagnosis and the level of assessment to have additional evidence beyond the Pure Tone Audiogram (PTA). The following guidance has been prepared by Corporate Medical Group with input from IIAC.

#### **The Advantages and Disadvantages of cERA**

cERA is not a superior test to PTA in all respects, as is sometimes suggested. Both methods of testing have their benefits. PTA is a more sensitive means of identifying hearing thresholds than cERA, so it remains the method of choice in assessing the threshold of hearing loss. Towards the hearing threshold the cERA signal becomes submerged in background signals so that the tracing can only be read to within 20 to 30 dB of the threshold. Mathematical techniques are then used to give the definitive readings.

cERA provides acceptable readings when readings are impossible to obtain by PTA. If the PTA is precise and repeatable then the PTA readings are likely to be more accurate than the cERA readings. Where the PTA is unreliable, due to the subject having difficulty in complying with the test, then cERA is the preferred test in that results can be obtained without the subject having to do anything other than lie still.

cERA helps to clarify the true level of hearing threshold when there is ambiguity between PTA readings.

cERA cannot discriminate as clearly as PTA between conductive and sensorineural hearing loss thresholds. If there is believed to be a conductive element to the hearing loss large enough to affect the diagnosis of PD A10, then a specialist's opinion may need to be obtained in order for the Decision Maker to have adequate evidence on which to base a decision.

#### **Appropriate use of cERA**

There are circumstances where those advising decision-makers require further information than is available from the current medical evidence. The Medical Adviser has to decide whether to use his/ her own expertise or if he/ she requires a specialist opinion. There are certain circumstances where cERA may provide the information that the decision maker requires.



cERA may be useful where:

- the PTA is not confirmed as being precise and repeatable
- there is a discrepancy between the PTA and the clinical findings of the Medical Adviser
- in reassessment cases, there is apparent improvement in the level of hearing loss.

cERA is unlikely to be useful where:

- the shape of the audiogram does not conform to the pattern for occupational deafness. However, this is discussed.
- PTA is not precise and repeatable

The audiometrician is expected to state how precise and repeatable the customer's audiometric responses were, and whether the audiogram was consistent with the audiometrician's informal observations. The Medical Adviser should not consider the case unless these sections have been completed, and should obtain a cERA if there is any doubt as to the reliability of the PTA.

- Inconsistency between audiogram and clinical findings

The clinical hearing tests are a useful means of confirming that the audiometric findings are reasonably consistent with the perceived level of hearing loss. If a person's hearing distance for a conversational voice (CV) is 1 metre, for example, their hearing loss should be about 60dB [approx 40% disablement]. If his hearing distance for a CV is 2 metres the loss should be about 50 dB [20% disablement]. These are approximate guides, and should not be treated as anything else, but Medical Advisers should carry them out in all cases and be prepared to question the validity of audiograms if they are not reasonably consistent with the clinical findings [e.g.. hearing loss 60dB on audiogram but hears conversational voice well over two metres away]. Where there is substantial incompatibility the Medical Adviser's suspicions should be aroused. cERA can provide useful additional evidence on which to base advice.

- Reassessment Cases - Apparent improvement in hearing loss

When a Medical Adviser has to advise on the claim again and there is an apparent improvement in the hearing loss, the Medical Adviser should conduct a clinical examination of the claimant, and consider all the evidence carefully before deciding on further action.

If the new audiogram is confirmed as being precise and repeatable, the shape of the audiogram fits the pattern of NIHL and clinical observations fit with the PTA findings, then the Medical Adviser would be expected to give advice based on the PTA readings. If there is any ambiguity in the newer findings whether in the reliability or shape of the PTA, or on clinical observation, then the Medical Adviser will need to obtain further evidence on which to base his/ her advice as follows:

- If the first assessment was based on a consultant report then it is recommended that a further consultant report should be requested, authorising the consultant to obtain cERA.

- If the first report was based on an audiometrician's report without a consultant opinion then the Medical Adviser may wish to request cERA itself to help identify which set of figures is more accurate.

The Medical Adviser should always comment on the difference between the two assessments, and explain why the newer set of readings should be accepted or rejected.

- Irregular shape of audiogram

There is a recognised shape to the audiogram in sensorineural hearing loss due to exposure to noise. The audiogram should have readings at the 500Hz, 1kHz, 3kHz, 4kHz, 6kHz and 8kHz. Features consistent with occupational hearing loss include:

- Maximum deficit in the 4kHz to 6kHz range
- Bilateral Symmetry

The typical audiogram of noise-induced hearing loss has a characteristic notch in the 4-6 kHz range. This notch may be obscured by the effects of presbycusis.

If the maximum hearing deficit occurs in the 0.5-3.0 kHz range or if there is an apparent profound hearing loss across the hearing range then the Medical Adviser will need to seek further information. Our guidance is that a consultant's opinion should be sought on the nature of the hearing loss. The specialist may require a cERA, and this should be authorised at the time the request for a consultant report is made. If a Medical Adviser requests a cERA, and this confirms the PTA reading indicating an additional pathology, further delay will be incurred as a specialist opinion will then be required.

Bilateral symmetry - The audiograms for both ears should be roughly symmetrical. If they are asymmetrical then the possibility of other pathology should be considered as a consultant report may be required, rather than relying on further requests for audiometry.

## **Conclusion**

Medical Advisers have always adopted a logical approach in assessing claims for occupational deafness, basing their assessment on the PTA in most cases, but taking into account their observations of the subject's voice-hearing ability, clinical findings, and features of the PTA, and being prepared to seek additional information or a specialist opinion where necessary. It is hoped that these guidance notes will clarify the usefulness of cERA, so that the Medical Adviser can decide whether to request further tests or to seek a specialist opinion on a more informed basis.

## **APPENDIX 7.**

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## **APPENDIX 8.**

### **MEMBERS OF OCCUPATIONAL DEAFNESS WORKING GROUP:**

Mr T W MAWER, Chairman  
Professor A J NEWMAN TAYLOR  
Mr M CINNAMOND  
Dr C TAYLOR  
Dr J OSMAN  
Mr H LESTER\*  
Mr O TUDOR  
Mr K BROUGHTON  
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### **IIAC Secretariat**

Previous Secretaries: Mrs A PACKER and Mr H LEIGH  
Previous Assistant Secretaries: Mr G ROACH; Mr A OSWICK;  
Mrs M CANTELL  
Previous Research Librarians: Mr P BANKS and Mr D TAYLOR

From 5 November 2001 the IIAC Secretariat was taken over by a Medical & Scientific Secretary and the Assistant Secretary title changed to Administrative Secretary. The current IIAC Secretariat is as follows:

Medical & Scientific Secretary: Dr P STIDOLPH  
Administrative Secretaries: Miss M RIGBY and Mr N DAVIDSON  
Research Librarian: Ms A LANNON

## **GLOSSARY OF TERMS**

### **Acoustic trauma**

Deafness caused by a sudden loud noise in the ear, e.g. firearms, rifles. Usually one ear is very much more affected than the other. The hearing loss is greatest at 4 kHz and often temporary, improving even to normal with time, but it can be permanent.

### **Conductive hearing loss**

A form of hearing impairment where there is an abnormality of the external or middle ear which prevents the normal transmission of sound to the inner ear.

### **Deafness**

Total hearing loss.

### **Decibel (dB)**

The unit used for expressing the physical magnitude of sounds.

### **Disability**

A disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being. Disability represents a departure from the norm in terms of performance of the individual, as opposed to that of the organ or mechanism.

### **Hearing Level**

For a specified frequency of pure-tone and testing system, the sound pressure level (essentially the physical magnitude of the sound in the case of air conduction audiometers) or vibratory force level (essentially the physical magnitude of vibration in the case of bone conduction audiometers) of the tone relative to that of a reference zero (as defined by an International or National Standard). It is the dial setting of an audiometer at which sound is heard if the instrument has been properly calibrated. Expressed in decibels ie as dB HL.

### **Hearing Loss**

An impairment of hearing that exceeds a specified level. No units, but may be qualified in terms of severity as mild, severe etc.

### **Hearing threshold level (HTL)**

For a particular ear, and a given frequency and test system, it is an individual's threshold of hearing (ie the quietest sound that he can hear) as determined in a stated manner and expressed by the system's indicated hearing level value. Expressed in decibels, ie as dB HTL.

### **Hearing threshold shift**

A change in the threshold of hearing for a given frequency (or group of frequencies ) over a particular period of time: expressed in decibels.

**Hertz (Hz)**

Unit of frequency (formerly cycles per second)

**Impairment**

Any loss or abnormality of psychological, physiological, or anatomical structure or function.

**Noise-induced sensorineural hearing loss**

Sensorineural hearing loss due to chronic exposure to noise, whether leisure, social or occupational. The loss is greatest in the highest frequencies, particularly at 4 -6 kHz and is usually bilateral and symmetrical in both ears. Initially, loss is temporary, then as exposure continues it becomes permanent.

**Non-organic hearing loss (also known as exaggerated or over-estimated hearing loss)**

Here the patient complains of hearing loss or a degree of deafness which cannot be identified or accounted for objectively.

**Occupational noise-induced hearing loss**

Noise-induced sensorineural hearing loss caused by exposure to loud noise at work over an extended time period.

**Sensorineural hearing loss**

A form of hearing impairment in which the abnormality is in the inner ear (cochlea), the auditory nerve or in the brain itself. There are various causes, including constitution, age and noise.

**Tinnitus**

A subjective noise sensation, not associated with any external acoustic, electrical or mechanical stimulus. Often described as ringing, heard in one or both ears. It may relate to acoustic trauma, Meniere's Disease or otosclerosis, or reflect age or noise-related hearing loss, or occur for no apparent reason.



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