Otorhinolaryngological assessment and psychological adjustment in tanning industry workers

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The purpose of the study was to verify the presence of any symptoms and otorhinolaryngological pathologies and to determine any discomfort and psychophysical changes among workers in the tanning industry. The study involved 129 subjects working in tanning industries in the Chiampo valley (Veneto region of Italy). Their clinical history was recorded and they underwent objective ENT examination and pure-tone audiometry. For the psychodiagnostic evaluation, four questionnaires were administered (EPI, STAI, ZUNG and GHQ). ENT assessment revealed no objective problems and findings were within the normal range in the majority of cases. Hearing function was also generally normal or within the normal range for an individual's age. Psychological evaluation revealed a valid psychological adjustment in almost all cases, despite the majority of workers reporting some subjective discomfort attached mainly to the particularly unpleasant smell in a micro-climate with a high rate of humidity. The findings of this preliminary investigation enable us to claim that the working environment in the tanning industries is not severely harmful for the upper airways and hearing function. It is worth noting the normality of the workers' psychological adjustment, which indicates a valid psycho-physical balance in these subjects who operate in an environment with unpleasant features.

Key words: ENT assessment; psychological adjustment; tanning.

INTRODUCTION

In the tanning industry the operations involved in treating leather include its preliminary preparation, the tanning proper and its subsequent processing.1 Preliminary operations include a disinfecting treatment (which involves the use of phenol, formaldehyde, SO₂, arsenious anhydride and a corrosive sublimate), a preserving treatment (using sodium chloride or diluted acids for the salting phase, and solutions of salt and sulfuric, hydrochloric, formic or acetic acids for the pickling phase). Then come various treatments in preparation for the tanning process, which consists of the following operations: soaking (using water alone or enzymes with a bland proteolytic and lipolytic effect); depilation-liming (during which the leather is treated with calcium hydroxide or sodium sulfide, with aliphatic amines and mercaptans); fleshing (which is done mechanically), de-liming (using weak organic acids and salts such as ammonium sulfide and sodium bisulfite); blubbering (which requires the use of surface-active substances or soaps); and steeping (in ammonium salts).

The tanning process is carried out with synthetic amine resins or chrome compounds. The subsequent processing of the leather consists in decoloring, weighing, dyeing, greasing, drying and finishing operations. Of all the substances used in the various processing cycles, the ones that are irritating and consequently potential sources of pathological conditions in the upper airways are essentially those involving lime, sodium hydroxide and sulfide, acids, phenol, formaldehyde, amines and proteolytic enzymes.2–5

In addition to any involvement of the upper airways, it is important to consider the potential effects on hearing function of exposure to the noise involved in the mechanical operations.

An equally important factor that, in our opinion, has generally received little attention in the past, is the particular environmental situation in which these processes are carried out, characterized by a micro-climate with a constant, high concentration of unpleasant smells sufficient to induce a subjective sense of psychological
and physical discomfort. In considering any effects that all these factors could have on the physical well-being of the workers, it is essential to take into account not only their exposure to noise and irritating substances, but also the particular environmental situation that could affect their psycho-physical balance.

With this in mind, an investigation was carried out on members of the working population in the Chiampo valley (in the Veneto region), one of the three major areas in Italy where extensive and well-developed tanneries are concentrated. The purpose of the study was to verify the presence of any symptoms and otorhinolaryngological pathologies and to determine any discomfort and psycho-physical changes among workers in the tanning industry.

SUBJECTS AND METHODS

The study involved 129 men (mean age 43.3 years; range, 26–58 years) who had worked in the tanning industry in the Chiampo valley for a period ranging from 5 to 15 years. From results of the latest chemical analysis carried out in the tannery in 1998, it appears that such workers were exposed to hydrogen sulfide, ammonia, amines, phenols and toluene in concentrations that were within the limits established for working environments by the American Conference of Governmental Industrial Hygienists (Table 1). The mean noise level in the work environment was 90 dB (range, 85–95 dB). Measurements of workplace noise levels showed that workers suffered daily exposure to repeated, but short-lived acoustic trauma of between 80 and 90 dB during the 8 working hours.

An accurate otorhinolaryngological clinical history was recorded for all the subjects with a view to establishing any remote or recent prior pathologies and any subjective symptoms in the ear, nose or throat, and otorhinolaryngological clinical examination, assuming as diagnostic criteria the mucosal feature, normal or inflammatory. The pure-tone audiometric test was performed in a soundproofed booth at least 10 h after the latest exposure to loud noise. Any subjects with current upper airway infection or treated with sympathomimetic therapy and any who were not exposed directly to the environmental conditions considered in the study were excluded from this series. Any foreign workers were also excluded because it was considered that their different mother tongue and cultural background would have led to their giving different answers in the psychological assessment questionnaires.

Any major discomfort reported by the subject in the working environment was recorded and a psycho-diagnostic evaluation was obtained by administering four questionnaires, i.e. the Eysenck Personality Inventory (EPI), the State Trait Anxiety Inventory (STAI), the Zung Self-Rating Depression Scale and the General Health Questionnaire. The EPI provides information on an individual’s personality considering three dimensions: neuroticism, extraversion and psychoticism; the STAI estimates the subjective evaluation of state and trait anxiety; the Zung test is a self-rating scale of the person’s state of mood; and the data emerging from the GHQ express the subject’s psychological discomfort.

RESULTS

Subjective and objective symptoms are given in Table 2. No objective otorhinolaryngological symptoms was reported in 79 subjects (61.2%). The following mild symptoms were reported in the remainder of subjects: sore throat in 34 (26.3%); nasal obstruction in 11 (8.6%); posterior rhinorrhea in four; and recurrent auricular pruritus in one (3.9%). Objective ENT findings were normal in 62 subjects (48.1%). A modest chronic rhinopharyngitis was observed in 36 subjects (27.9%), a subacute rhinitis in 18 (13.9%), and a subacute oropharyngitis in 13 (10.1%). No laryngeal alterations were found.

The audiometric test detected normal hearing function in 67 subjects (52%) (mean age, 37 years). A hearing deficiency attributable to the onset of presbyacusia was found in 40 subjects (31%) (mean age, 51.6 years), considering that the mean level of onset of presbyacusia for frequencies of 500, 1000, 2000, 4000 and 8000 Hz is 95 dB; while for frequencies of 2 and 4 kHz it is 7 dB at 45 years, 10 dB at 50 years, and

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**Table 1. Analysis of air-borne contaminants in the working environment**

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentration (mg/m³ of air)</th>
<th>C/TLV</th>
<th>TLV/TWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen sulfide</td>
<td>0.2</td>
<td>0.01</td>
<td>14</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.3</td>
<td>0.02</td>
<td>18</td>
</tr>
<tr>
<td>Amines</td>
<td>&lt;0.1</td>
<td>0.00</td>
<td>12</td>
</tr>
<tr>
<td>Phenols</td>
<td>&lt;0.1</td>
<td>0.00</td>
<td>19</td>
</tr>
<tr>
<td>Toluene</td>
<td>&lt;0.1</td>
<td>0.00</td>
<td>375</td>
</tr>
<tr>
<td>Total mixture</td>
<td></td>
<td>0.06</td>
<td>1</td>
</tr>
</tbody>
</table>

C=concentration; C/TLV=concentration/Threshold Limit Value; TLV/TWA=Time Weighted Average as given by the American Conference of Governmental Industrial Hygienists.

**Table 2. Otorhinolaryngologic symptoms and observed pathological alterations**

<table>
<thead>
<tr>
<th>ENT symptoms</th>
<th>Percent of subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>48.1</td>
</tr>
<tr>
<td>Rhinopharyngitis</td>
<td>27.9</td>
</tr>
<tr>
<td>Rhinitis</td>
<td>13.9</td>
</tr>
<tr>
<td>Oropharyngitis</td>
<td>10.1</td>
</tr>
<tr>
<td>Subjective</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>61.2</td>
</tr>
<tr>
<td>Oropharyngeal pain</td>
<td>26.3</td>
</tr>
<tr>
<td>Nasal stenosis</td>
<td>8.6</td>
</tr>
<tr>
<td>Others</td>
<td>3.9</td>
</tr>
</tbody>
</table>
12 dB at 55 years. A slightly raised threshold, only at a frequency of 4 kHz, typical of an initial noise-induced hearing loss, was noted in 22 subjects (17%) (Fig. 1).

Sixty-seven subjects (52%) attributed the discomfort experienced in the workplace to the bad smell; nine subjects (7%) attributed it to the noise; 13 (10%) to the physical fatigue; and 22 (17%) to psychological stress. Eighteen subjects (14%) reported no discomfort (Table 3).

Table 4 shows the average scores obtained in the four psychological tests as compared with the reference values. In the personality assessment, all the subjects were within the normal range for psychoticism and extroversion, while a slightly higher than normal score was found for neuroticism in 45 cases.

The values found with the Zung test indicated a mild state of depression in 10 cases, while the STAI detected a mild state of anxiety in 13 cases. The score obtained from the GHQ was within the normal range in all cases.

DISCUSSION

The objective ENT symptoms reported by the workers mainly involved cases of sore throat. There were a few cases of mild oropharyngeal inflammation, and one case of chronic tonsillitis. On the other hand, an oropharyngeal hyperaemia, albeit mild, was detected in three subjects who reported no symptoms. Three workers presented modest signs of rhinitis, one was found to be affected by chronic rhinitis of an allergic type, but none of these complained of nasal disorders.

The substantial lack of the objective ENT findings and the absence of significant symptoms in the ear, nose and throat led us to believe that present-day methods and the duration of exposure to the substances used in the tanning process by the leather industry workers considered in our study are not particularly hazardous for the upper airways.

In the majority of cases, the hearing function was also normal or within the normal range for the individual's age. Only 22 cases presented a slightly higher hearing threshold restricted to a frequency of 4 kHz. This finding might indicate an initial stage of damage due to acoustic trauma, but these subjects had previously been exposed to other sources of noise at work, before they came into the tanning industry.

As was to be expected, the main discomfort experienced in the workplace was the unpleasant smell that persisted throughout the working shift and was perceived as very strong, also because it circulated in a microclimate with a high degree of humidity. This discomfort was reported by the majority of the workers, while fewer of them complained of the psycho-physical stress and the problem of noise.

Although the working environment is characterized by the presence of a widespread and constantly unpleasant smell that is very irritating, and the type of work is stressful from a psycho-physical point of view (as reported by the majority of the subjects), we observed a valid psycho-physical adjustment in almost all cases. In fact, the data obtained from the personality study indicate that all the subjects have neuroticism values within the normal range, i.e. they are not anxious or worried, they do not suffer from changeable mood, they are rarely depressed or easily excitable and, thanks to their valid control of their impulses and emotions, they have a good capacity for adaptation. They also come within the normal range for extroversion, which shows good social integration that balances possible psychotic tendencies.

As for psychoticism, which completes the personality picture, the slightly higher than normal score indicates a
predisposition for non-conformism (for example, the tendency for alcohol and nicotine abuse; or to become irritated, with flashes of anger), but without reaching any genuine maladjustment, also because the psychotic trait masks a paranoid tendency at a deep level. Generally speaking, these individuals are well integrated in society, with trust in themselves and in others, capable of concentration and attention to daily tasks, responsible for their actions, and ready to deal adequately with any difficulties or change.

We did not detect any chronic psychological problems. Almost all the workers demonstrated an excellent capacity for comparison, enterprising spirit and the ability to tolerate discomfort. Finally, no cases revealed a condition of genuine psychological unbalance.

CONCLUSIONS

In the tanning industry of the Chiampo valley in Italy, efforts have been made in recent years to analyse and improve the working environment for the whole production sector, with particular attention to job safety and hygiene in the workplace, in an attempt to improve the working environment. This has been made possible thanks to the formation of a study group which, over a short period, found the technical solution for many risks present in the industry. In some cases the steps taken have been applied only to buildings under construction, while many have been applied to tanneries which exist already. Others have been applied to single machines or plants. Moreover, a Guide to the Prevention of Higher Risk Factors in the Tanning Industry has been compiled, which indicates the improvements to be made.

Our findings lead us to conclude that the efforts made so far to improve the working environment in the tanning industry have succeeded in restricting potential damage to the ear, nose and throat, which consists mainly of irritation of the upper airways. Comparison with previously existing psychological assessment is not possible because these evaluations have not been made before. The achievement of higher safety levels and the workers' valid adjustment to the type of work is linked not only to the environmental changes that have been implemented, but also to a better understanding of the technological cycle, of the actual risks involved, and of the numerous programmes for environmental improvement designed to protect the workers' health.

REFERENCES