INTERNATIONAL LABOUR ORGANISATION

Programme of Industrial Activities

FOOD AND DRINK INDUSTRIES COMMITTEE

FIRST SESSION

GENEVA, 1984

Occupational Safety and Health and Working Environment in the Food and Drink Industries
INTRODUCTION ..................................................................................................................... 1

CHAPTER I: CHARACTERISTICS OF UNDERTAKINGS IN THE FOOD AND DRINK
INDUSTRIES IN RELATION TO THE PROBLEM OF OCCUPATIONAL
SAFETY AND HEALTH ................................................................. 3

Definition of the sector ........................................................................................................ 3
Size of the undertakings ........................................................................................................ 3
Level of skills .......................................................................................................................... 4
Irregularity of work ............................................................................................................... 7
Rural workforce ...................................................................................................................... 7
Training ................................................................................................................................ 8

CHAPTER II: INDUSTRIAL ACCIDENTS ............................................................ 11

Comparisons between countries ......................................................................................... 11
Comparisons within the sector .............................................................................................. 14
Accidents according to severity ............................................................................................ 16
The cost of accidents .............................................................................................................. 16
Slipping, tripping and falling ................................................................................................. 17
Accidents with powered industrial trucks ........................................................................... 18
Accidents with refrigerated or isothermal vehicles ............................................................... 19
Wrapping and packaging ..................................................................................................... 20

CHAPTER III: OCCUPATIONAL DISEASES .................................................. 23

Infectious diseases (zoonoses) ............................................................................................. 23

Brucellosis ............................................................................................................................. 23
Anthrax ................................................................................................................................ 24
Leptospirosis ......................................................................................................................... 24
Tularaemia ............................................................................................................................. 24
Tuberculosis ........................................................................................................................... 24
Ornithosis ............................................................................................................................... 25
Skin diseases of viral origin .................................................................................................. 25
Erysipeloid .............................................................................................................................. 25
Epidermomycosis .................................................................................................................. 25
Toxoplasmosis ....................................................................................................................... 26

Respiratory diseases ............................................................................................................ 26

Irritant effects ....................................................................................................................... 26
Allergic effects: occupational asthma .................................................................................. 26
Immuno-allergic effects: extrinsic allergic alveolitis ............................................................ 27
### Skin disorders ................................. 28
- Heat-related disorders ................................ 28
- Occupational dermatitis ................................ 28
- Skin diseases of infectious origin ....................... 29
- Insect stings ............................................ 29

### Chemical hazards .................................. 29

### Dental caries ....................................... 30

### CHAPTER IV: ADVERSE EFFECTS OF THE PHYSICAL ENVIRONMENT -

Rotating shift work .................................. 33
- Adverse effects of the physical working environment ............... 33
  - Noise .................................................. 33
  - Cold .................................................. 33
  - Combination of harmful factors in the meat industry ............. 34
  - Electricity .......................................... 35
  - Ionising radiations ................................... 36
  - Non-ionising radiations ................................ 36

### Rotating shift work ................................ 36

### CHAPTER V: PREVENTION ............................. 39

- Introduction .......................................... 39
- Guarding of machinery .................................. 39
  - Meat-canning and salting ................................ 39
  - Vegetable canning ...................................... 40
  - Bakeries .............................................. 40
  - Breweries ............................................. 41
  - Sugar refineries ....................................... 41
  - General recommendations ................................ 41

- Individual means of protection ............................. 42
- Treatment of the environment ............................. 44
  - Elimination of smells .................................. 44
  - Noise .................................................. 45
  - Heat .................................................. 45
  - Cold .................................................. 46

- Ergonomic conception and analysis of workloads:
  - the search for a global method of prevention .................. 46
- The role of prevention in the food and drink industries ......... 47
- Problems arising in developing countries and in small-
  and medium-sized undertakings ............................ 48
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of employers, workers and governments</td>
<td>50</td>
</tr>
<tr>
<td>CHAPTER VI: MEDICAL SUPERVISION AND PERSONAL HYGIENE</td>
<td>53</td>
</tr>
<tr>
<td>The occupational health services</td>
<td>53</td>
</tr>
<tr>
<td>The prevention of food poisoning</td>
<td>54</td>
</tr>
<tr>
<td>Occupational hygiene, labour inspection and organisation of work</td>
<td>55</td>
</tr>
<tr>
<td>Hand washing</td>
<td>56</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>59</td>
</tr>
<tr>
<td>SUGGESTED POINTS FOR DISCUSSION</td>
<td>61</td>
</tr>
</tbody>
</table>
INTRODUCTION

The present report marks a further stage in the study of the risks, and
the prevention of the risks, in the food and drink industry, in the sense that
it in no way renders obsolete Report III of 1963, but aims to suggest fresh
prospects for preventive action in the light of recent studies and research.

It is hoped to show in this report that an excessively traditional view
of safety, concerned only with the prevention of industrial accidents and
occupational diseases, offers little or no scope for dealing with all the
divers hazards that are very common in the food industry.

The report consists of six chapters. Chapter I describes some of the
characteristics of the sector that ought to be taken into account from the
point of view of occupational safety and health, including the size of the
enterprises, occupational skill, the irregularity of the work, rural manpower,
and training.

Chapter II cites some illustrative examples of statistics of industrial
accidents in the sector, taken mainly from industrialised countries, and
refers to the difficulties of obtaining and integrating the data for the
purpose of planning preventive action. Detailed comments are offered on
types of accidents that occur frequently in the sector.

Chapter III, dealing with occupational diseases, refers to certain
ailments that have attracted notice, either because it was not known that
their origin was traceable to this occupational sector or because they were
introduced by new technical processes. Chapter IV deals with physical
hazards and also refers to some combinations of hazards.

Chapter V, the longest, discusses technical prevention. It refers to
the methods of analysing dangerous situations, including the methods devised
by ergonomists, which make it possible to investigate the multiple causes of
accidents and to take remedial preventive action at very different stages:
not only the machine or the tool needs to be improved but also the mode of
operation, the organisation of the work, relations between production and the
maintenance service, and vocational training (including greater awareness of
safety considerations), etc.

What is most encouraging about the food and drink industries, however, is
that the prevention of accidents and disease should perforce be thought of in
conjunction with the demands of production, in order that the product should
satisfy all the standards of hygiene and appearance. The report strongly
recommends a reappraisal of certain functions, especially that of the
inspector of meat and other perishable products, and the appointment of
multidisciplinary research teams either at plant level (if the firm is big
enough) or for a group of enterprises in one and the same sector or forming
part of a chain. Chapter V considers, in addition, special situations in the
developing countries and in small and medium firms. The problems which arise
in this sector arise in other sectors as well, and the same difficulties
hamper the adoption of effective preventive measures. Special reference is
made, at the end of the chapter, to the role of workers' and employers'
organisations in preventive action.

The final chapter deals with medical supervision and personal hygiene.
After some general remarks on occupational health services, some more
particular comments are offered on the specific aspects of the food and drink
industries, especially the prevention of toxic food infection. Attention is
drawn to the importance of labour inspection and the organisation of work in connection with health protection measures, and to certain specific precautions, such as the washing of hands, as a typical safeguard measure that protects both the worker and the product and hence also the consuming public.

Note

CHAPTER I

CHARACTERISTICS OF UNDERTAKINGS IN
THE FOOD AND DRINK INDUSTRIES

Definition of the sector

The study of the characteristics peculiar to undertakings in the food and drink industries in various countries, and of occupational safety and health problems in this industry, is more difficult than that of other economic sectors owing to the differences in the sector's structure. Not infrequently, the classification of industrial groups or subgroups varies from one country to another, or even from one region to another in the same country. For example, in a recent census carried out in a European country the "manufacturers" - but not the sales personnel - and bakers - but not butchers - are classed in the agricultural foodstuffs sector. In one region of the same country, butchers' shops, bread and cake shops, delicatessens and pastry/confectionery shops are all classed together.

Consequently, comparative studies of industrial accidents and occupational diseases in different countries are often of limited scope. Nevertheless, certain general characteristics are discernible in the food and drink industries in the context of the studies on the hazards of industrial accident and occupational disease (size of undertakings, level of skill, irregularity of the work, employment of rural manpower, training of employees).

Size of the undertakings

The size of the undertaking has an important bearing on the risk of industrial accident. It can be shown, by reference to insurance data and surveys carried out in various countries, that in general the danger is greater in small and very small undertakings than in big plants. In the food and drink industries, as in all industries, the number of undertakings is inversely proportional to their size, though this is not true of all branches of the food industry, in so far as small-scale undertakings are distinguished from industrial ones and provided, moreover, that the manufacturing sector is not lumped together with the distribution sector. The smallest undertakings which employ a smaller workforce - and hence pay smaller insurance contributions - often account for a proportionately higher accident frequency.

For purposes of prevention, these general considerations are of some practical relevance. The largest plants are those which are most often visited by labour inspectors; it is these undertakings which are in the best position to make investments in safety and health; they have least difficulty in recruiting specialised staff (works physicians, safety engineers, etc.); they are in the best position to apply to university institutes for help in carrying out job surveys or other studies; and they are the best informed about scientific research that is publicised in specialised journals. There are always exceptions to the rule, but there is no doubt that the smaller the undertakings are, the more they are left to their own devices.
What is more, the larger the enterprise the more easily it has access to the facilities mentioned above and the greater is its interest in the development of occupational health and safety in all its aspects. This was the conclusion reached by a wide-ranging survey carried out in Switzerland among industrial enterprises.4

The notion of size of undertaking is, of course, a hybrid one: size is reflected, to be sure, in the number of employees but also in the fact that they are all gathered together on the same premises. In several countries, for economic reasons, the very large firms have been formed by the take-over of smaller units. The evidence definitely seems to indicate that, from the point of view of safety and health, it is an advantage for even quite small units to belong to a larger group. It is quite possible that a least one of the reasons is selectivity, since the smallest undertakings employ more people who are specially vulnerable: lower skill, lower seniority, and other negative factors.

The contemporary world industrial policy favours the large food-processing units characterised by high productivity. At present, 100 industrial groups account for 40 per cent of the world output of agricultural foodstuffs. These are principally multinational enterprises heavily represented in the developing countries, whereas the small firms are mostly in Europe.

**Level of skills**

Another contributory factor of accidents and occupational diseases is the level of skills. This again is not a simple notion, for the manufacturing processes which make do with low-skilled staff are intrinsically liable to cause accidents, in cases where the monotony of uninteresting work - which leads to absent-mindedness - is aggravated by unpleasant working conditions (noise, heat, etc.).

Table 1 sets out the distribution of employees in France in 1968 and 1976; the proportion of unskilled workers is higher in the food than in the other industries, and the managerial staff is smaller in the manufacturing sector, whereas in the services sector the proportions are favourable to the food sector.

Female staff tends to be more skilled in the services than in the manufacturing sector, as is shown by table 2. In the Rhône-Alpes region of France, the number of women in the food industry is rising; however, there are virtually no women in the higher echelons, i.e. at the grade of engineer or technical manager.

Although women account for a large share of the workforce employed in the food industry in all countries, it is very unlikely that the level of skill of the female employees is different from that in France.
Table 1: Distribution of employees (job aggregates) in industry and in the agricultural foodstuffs industries (AFI), France 1968 and 1976 (percentages of the total)

<table>
<thead>
<tr>
<th></th>
<th>1968</th>
<th>1976</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AFI</td>
<td>Industry</td>
</tr>
<tr>
<td>Production personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial, technical and supervisory staff, of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- engineers, technical production managers</td>
<td>1.13</td>
<td>1.9</td>
</tr>
<tr>
<td>- technicians, technical production personnel</td>
<td>1.74</td>
<td>4.6</td>
</tr>
<tr>
<td>- production supervisors</td>
<td>2.63</td>
<td>4.6</td>
</tr>
<tr>
<td>Operational staff, of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- skilled workers</td>
<td>22.54</td>
<td>38.5</td>
</tr>
<tr>
<td>- workers without special skills</td>
<td>39.94</td>
<td>33.0</td>
</tr>
<tr>
<td>Service personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managerial, technical and supervisory staff, of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- executives, technical service managers</td>
<td>4.19</td>
<td>3.0</td>
</tr>
<tr>
<td>- technicians, technical service staff</td>
<td>4.42</td>
<td>1.9</td>
</tr>
<tr>
<td>- supervisory staff</td>
<td>1.60</td>
<td>1.1</td>
</tr>
<tr>
<td>Service-performing staff, of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- skilled staff</td>
<td>17.75</td>
<td>8.8</td>
</tr>
<tr>
<td>- staff without special skills</td>
<td>3.93</td>
<td>2.4</td>
</tr>
<tr>
<td>Miscellaneous occupations</td>
<td>0.07</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: INSEE: Enquêtes sur l'emploi (Paris).

5045d/v.2
Table 2: Evolution of the structure of employment in the agricultural foodstuffs industry (AFI) in the Rhône-Alpes region of France, 1970 and 1975

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F*</td>
<td>F</td>
<td>F*</td>
<td>F</td>
</tr>
<tr>
<td><strong>Production personnel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineer-managers</td>
<td>0.8</td>
<td>1.9</td>
<td>0.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Technicians, technical staff</td>
<td>1.5</td>
<td>0.2</td>
<td>0.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Supervisory staff</td>
<td>1.5</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>22.3</td>
<td>8.0</td>
<td>22.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Unskilled workers</td>
<td>38.4</td>
<td>18.1</td>
<td>38.8</td>
<td>14.6</td>
</tr>
<tr>
<td><strong>Service personnel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executives</td>
<td>4.7</td>
<td>0.3</td>
<td>4.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Supervisory staff</td>
<td>1.5</td>
<td>0.4</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Skilled employees</td>
<td>18.4</td>
<td>8.6</td>
<td>23.5</td>
<td>8.1</td>
</tr>
<tr>
<td>Unskilled employees</td>
<td>4.1</td>
<td>2.7</td>
<td>2.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* F = Female staff.

Irregularity of work

A further factor prejudicial to safety is the irregularity of the work, which at times involves the recruitment of large numbers of employees with little training.

This is precisely one of the characteristics of the food industry. There are two reasons for the seasonal fluctuation typical of the food sector:

- the first and by far the most important reason is the seasonality of the arrival of the raw material supplied to the industries by agriculture, cattle farms and the fisheries;
- the second reason is the seasonality of the demand for finished products (though this is mitigated by the efforts made by the distributors to reduce these particular fluctuations).

These seasonal fluctuations affect the labour force in several respects, viz:

- hours of work (a longer working day or working week at the time of the salmon catch (see dermatosis));
- rearrangement of work schedules;
- workers' income;
- social security coverage;
- vocational training.

The meat and dairy industry is much less affected by seasonal fluctuations than the fruit and vegetable or fishing industries, but the demand for poultry during the festive season in France, for example, is a not insignificant phenomenon.

In some regions, the seasonal fluctuations may be accompanied by veritable migratory movements, but these are perhaps less important for the food-processing industries than for agriculture, particularly at harvest time (fruits, vegetables, cereals, etc.).

Rural workforce

Another characteristic of the food sector is that it employs rural labour.

In France, for example, about 37 per cent of the wage-earning population lives in rural areas, and firms are encouraged more and more to set up plants in rural communes; at present, 17,500 undertakings carry on operations in communes with fewer than 2,000 inhabitants: these undertakings account for 20 per cent of the industrial establishments employing ten or more workers.

The employers are looking for pools of manpower released by changes in the agricultural sector; in addition, in the case of the dairy and poultry farming industries, the fact that production costs are lower thanks to proximity to the farms is an additional attraction.
The labour force of the undertakings of the food sector that have set up plants in rural areas consists in part of "farmer-workers" who abandon the plough in order to take a job.

These workers - men and women - have their own life style, which has many implications for the conduct of the undertaking’s operations. The undertaking benefits from the fact that, in performing their jobs, these "farmer-workers" can draw on the experience they have acquired on their farms (e.g. they are accustomed to handling animals), but the undertaking has to put up with seasonal absenteeism, particularly during the hay-making season or during the wheat harvest, which brooks no delay. These workers are accustomed to doing a double day's work and do not mind the occasional night shift in the plant. From this point of view, the undertakings benefit, even though they may not regularly employ the female workers on the night shift.

As regards occupational diseases, the "farmer-workers" are in a special position. It is not uncommon to find among the personnel of the industrial slaughterhouses "farmer-workers" who raise their own livestock and who slaughter animals on their own farm. That being so, how can one tell whether some particular case of dermatosis was contracted in the slaughterhouse or on the farm? Besides, the health and safety conditions on the "farmer-worker's" own farm may well be distinctly inferior to those under which he works in the plant. While this labour force is less at risk than the urban labour force, it is also less fussy about conditions of work and is content, perhaps, with less than perfect safety and health.

Training

In the food sector, which (as has been shown) employs mainly relatively unskilled personnel, the training of employees takes place predominantly "on the job". For certain tasks, however, like the preparation of meat, some special knowledge is needed that may have implications for safety and health: handling of knives, familiarity with the material, hygienic treatment of the material, washing of hands, cleanliness of working clothes, etc. This report will refer later on to the importance of sound vocational training in the prevention of accidents and diseases, in the interest not only of the worker but also of the consumer.

In France, for example, there are seven national dairy industry training schools, under the authority of the Ministry of Agriculture, which provide training to satisfy the dairy industries' demand for skilled personnel; such training is provided both as part of school education and in the context of a programme of technical education for adults. In the case of adults, most of these teaching establishments award vocational diplomas on completion of a one-year training course.

Notes

1 E. Ollagnier and P. Rey: "Caractéristiques générales de l'industrie agro-alimentaire", ECOTRA (Centre for labour ecology), Geneva University, 1981.

2 M. Gressot and P. Rey: Analyse épidémiologique d'accidents professionnels, based on CNA data, in Médecine sociale et préventive, No. 27, (Soleure 1982), pp. 167-172.
3 R. Mendes: Importância das pequenas empresas industriais no problema de acidentes de trabalho em São Paulo (Sao Paulo, Faculty of Public Health, University of Sao Paulo, 1975).

CHAPTER II

INDUSTRIAL ACCIDENTS

Comparisons between countries

Before making such comparisons, their difficulties have to be stressed: dissimilar data, rates calculated in different ways, varying definitions of the food sector, etc. Tobacco is often included in the food industry though this has no significance for the present report.

The statistics given hereafter reveal the position of the food products and drinks industry in relation to some other sectors of production in selected countries.

It will seen, for example, that in Belgium in 1982 (table 3) the food industry takes second place for accident frequency, quite a way behind construction (which is understandable), but considerably ahead of textiles which might be thought to employ fairly similar categories of employees to the food industry. As regards the severity of accidents - at least according to its definition - the food industry falls into the same bracket as textiles and paper. It may therefore be concluded so far that in Belgium accidents in the food industry are very frequent but that many of these accidents entail only short absences from work.

What is interesting about the Belgium statistics is the denominators that have been chosen: workers exposed to risk and not an estimated number of persons.

Table 3: Frequency and severity of industrial accidents in selected branches of activity in Belgium, 1982

<table>
<thead>
<tr>
<th>Branch of activity</th>
<th>Rate of frequency</th>
<th>Rate of severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal trades</td>
<td>57.85</td>
<td>1.34</td>
</tr>
<tr>
<td>Chemical industry</td>
<td>35.36</td>
<td>0.62</td>
</tr>
<tr>
<td>Food, drink, tobacco</td>
<td>61.68</td>
<td>1.01</td>
</tr>
<tr>
<td>Textiles</td>
<td>50.87</td>
<td>0.81</td>
</tr>
<tr>
<td>Paper</td>
<td>49.39</td>
<td>0.83</td>
</tr>
<tr>
<td>Printing</td>
<td>28.03</td>
<td>0.44</td>
</tr>
<tr>
<td>Construction</td>
<td>96.08</td>
<td>1.98</td>
</tr>
</tbody>
</table>

Frequency: Number of accidents x 1 000 000
Number of man-hours worked

Rate of severity: Number of days lost x 1 000
Number of man-hours worked

Recent statistics for France (table 4) represent accidents too serious not to have resulted in absence from work. It will be seen further on, with regard to etiological research and prevention, that minor but often very common accidents are actually very important. In the French statistics the denominator is based on hours worked, possibly because the number of persons exposed to risk is not known accurately.

In France the food industry occupies a middle position as regards both frequency and severity of accidents. As is to be expected, the building industry heads the list. It may be mentioned in passing that the chemical industry is no longer a very dangerous sector, probably because of the technical changes it has undergone in recent years.

Table 4: Frequency and severity of industrial accidents in selected branches of activity in France, 1983

<table>
<thead>
<tr>
<th>Branch of activity</th>
<th>Number of employees</th>
<th>Number of accidents</th>
<th>Rate of frequency</th>
<th>Rate of severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metallurgy</td>
<td>2,702,303</td>
<td>224,644</td>
<td>44</td>
<td>1.07</td>
</tr>
<tr>
<td>Building and public works</td>
<td>1,558,906</td>
<td>231,215</td>
<td>76</td>
<td>2.67</td>
</tr>
<tr>
<td>Chemical industry</td>
<td>332,590</td>
<td>17,637</td>
<td>28</td>
<td>0.81</td>
</tr>
<tr>
<td>Rubber, paper</td>
<td>225,706</td>
<td>17,003</td>
<td>40</td>
<td>1.11</td>
</tr>
<tr>
<td>Textiles</td>
<td>254,603</td>
<td>13,763</td>
<td>29</td>
<td>0.74</td>
</tr>
<tr>
<td>Food</td>
<td>1,148,726</td>
<td>90,039</td>
<td>41</td>
<td>1.02</td>
</tr>
<tr>
<td>Transport</td>
<td>544,741</td>
<td>51,896</td>
<td>49</td>
<td>1.72</td>
</tr>
</tbody>
</table>

Rate of frequency: Number of accidents involving absence from work x 1,000,000

Rate of severity: Number of days lost x 1,000
Number of hours worked


From the 1980 statistics issued by the Ministry of Labour of the Federal Republic of Germany (table 5), it can be deduced that the food industry has higher frequency rates than textiles or the chemical industry although the accident frequency is a good way behind that in construction, while the rate of severity in the food industry is lower than in other branches of industrial activity.

The Swiss National Industrial Accident Insurance Fund (CNA) (table 6), deals with occupational disease in the same category as industrial accidents for the purposes of compensation. This practice may result in higher figures in certain sectors where there is a high risk of toxicity (as in chemicals for example) or increase those in respect of work sites (length of absence from work for silicosis).
Table 5: Frequency and severity of accidents in selected branches of activity in the Federal Republic of Germany, 1980

<table>
<thead>
<tr>
<th>Sector</th>
<th>Rate of frequency</th>
<th>Rate of severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>80.1</td>
<td>2.14</td>
</tr>
<tr>
<td>Machines</td>
<td>67.6</td>
<td>0.87</td>
</tr>
<tr>
<td>Chemical industry</td>
<td>32.6</td>
<td>0.54</td>
</tr>
<tr>
<td>Paper</td>
<td>74.8</td>
<td>0.89</td>
</tr>
<tr>
<td>Construction</td>
<td>77.6</td>
<td>0.55</td>
</tr>
<tr>
<td>Textiles</td>
<td>22.3</td>
<td>0.33</td>
</tr>
<tr>
<td>Food</td>
<td>38.4</td>
<td>0.22</td>
</tr>
<tr>
<td>Meat</td>
<td>116.6</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Source: Unfallverhütungsbericht des Bundesminister für Arbeit und Sozialordnung (Bonn, 1980).

It will thus be seen that in Switzerland too the food industry has a high accident frequency (expressed as the number of cases per 100 workers). Severity might be assessed by comparing the number of minor cases with those having entailed at least three days' absence from work. In Switzerland, serious accidents are not unknown to the food industry.

Table 6: Switzerland: Five-year period 1973-77 Comparative figures for selected branches of activity

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of workers</th>
<th>Number of accidents per year</th>
<th>Number of cases of invalidity</th>
<th>Fatal accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minor</td>
<td>Common</td>
<td>Total</td>
</tr>
<tr>
<td>Chemical industry</td>
<td>53 099</td>
<td>2 316</td>
<td>2 684</td>
<td>5 000</td>
</tr>
<tr>
<td>Footwear</td>
<td>6 776</td>
<td>221</td>
<td>258</td>
<td>479</td>
</tr>
<tr>
<td>Food</td>
<td>36 901</td>
<td>2 679</td>
<td>4 086</td>
<td>6 765</td>
</tr>
<tr>
<td>Watch and clockmaking</td>
<td>57 598</td>
<td>2 123</td>
<td>1 388</td>
<td>3 511</td>
</tr>
<tr>
<td>Clothing</td>
<td>33 028</td>
<td>696</td>
<td>847</td>
<td>1 543</td>
</tr>
<tr>
<td>Brewing industry</td>
<td>4 433</td>
<td>1 727</td>
<td>2 256</td>
<td>3 983</td>
</tr>
</tbody>
</table>

Even today a comparison of accident statistics at the national level or between countries remains difficult, for several reasons.

One aspect is the difference in nomenclature mentioned in the previous chapter. For example there is the annoying habit followed by certain countries of combining other sectors with industry while other countries, on the contrary, separate them. Tobacco is often grouped with the food industry although they do not have the same characteristics particularly when it comes to the type of personnel or the factory layout, two factors whose importance was seen in respect of safety and health.

A second difficulty lies in the fact that data are not presented in the same way and that rates are not calculated according to the same criteria.

It will be seen further on that markedly sectoral statistics or specific epidemiological surveys are ultimately more significant from the safety point of view than major national statistics.

The question arises, moreover, when making comparisons between countries whether the data were gathered with the same facility in all sectors of production or whether numerous cases may have evaded the statistics.

Comparisons within the sector

An important step to be taken in determining preventive measures is to make comparisons in a given country between the various branches of activity within the food industry.

It is clear that a single figure cannot represent the considerable variety of hazards within the food sector.

This variety is immediately evident if one compares the amounts of benefits paid out by an insurance fund such as the CNA (National Accident Insurance Fund) in Switzerland (table 7).

Table 7: Insurance benefits (for industrial accidents and occupational diseases) paid in the food and drink industries in Switzerland, 1972-77 (per thousand of the aggregate remuneration)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>5.2</td>
</tr>
<tr>
<td>Breweries</td>
<td>12.4</td>
</tr>
<tr>
<td>Food products</td>
<td>11.5</td>
</tr>
<tr>
<td>Sugar manufacture</td>
<td>13.5</td>
</tr>
<tr>
<td>Chocolate</td>
<td>7.0</td>
</tr>
<tr>
<td>Bakeries</td>
<td>8.7</td>
</tr>
<tr>
<td>Abattoirs</td>
<td>15.8</td>
</tr>
<tr>
<td>Butchers and delicatessens</td>
<td>16.6</td>
</tr>
<tr>
<td>Dairies</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Source: See table 6.
A study of table 8 reveals that in the United Kingdom the degree of risk varies according to the branch of activity within the major category of the food industry. In these figures serious and fatal accidents stand out, particularly in the branches of milk and dairy products, oils and sugar, with meat coming at the same level as milling and drinks. In the second column, however, it will be seen that meat is the cause of numerous less serious accidents. The branch most striking for high frequency and degree of severity is that of vegetable and animal oils.

Table 8: Incidence rate of accidents per 100,000 workers in the food industry, by branch of activity, in the United Kingdom

<table>
<thead>
<tr>
<th>Branch of activity</th>
<th>Incidence rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Serious and</td>
</tr>
<tr>
<td></td>
<td>fatal accidents</td>
</tr>
<tr>
<td>Food in general</td>
<td></td>
</tr>
<tr>
<td>(including tobacco):</td>
<td></td>
</tr>
<tr>
<td>Grain milling</td>
<td>97.8</td>
</tr>
<tr>
<td>Bread and flour confectionery</td>
<td>69.6</td>
</tr>
<tr>
<td>Biscuits</td>
<td>30.3</td>
</tr>
<tr>
<td>Meat and fish products</td>
<td>91.6</td>
</tr>
<tr>
<td>Milk and dairy products</td>
<td>150.7</td>
</tr>
<tr>
<td>Sugar</td>
<td>101.0</td>
</tr>
<tr>
<td>Fruit and vegetables</td>
<td>64.3</td>
</tr>
<tr>
<td>Animal and vegetable oils</td>
<td>145.2</td>
</tr>
<tr>
<td>Breweries</td>
<td>66.4</td>
</tr>
<tr>
<td>Drinks: water, fruit juices</td>
<td>99.4</td>
</tr>
</tbody>
</table>

Comparison with other sectors:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>95.2</td>
</tr>
<tr>
<td>Textiles (machines)</td>
<td>99.4</td>
</tr>
</tbody>
</table>


In comparison with the two other sectors whose data are derived from the same source, it may be concluded that certain activities in the food industry are highly dangerous, others less so. Priorities will have to be established as regards prevention. It will be seen below, however, that the food industry is not responsible only for accidents but that it exposes workers to other harmful factors whose influence on work cannot be overlooked. The order of priorities must therefore take account of all the risks involved.
Accidents according to severity

According to observations¹ made in respect of serious accidents, the first position is held by meat-processing plants, slaughterhouses, sugar manufacture and drinks. The other activities are a long way behind. If severity is estimated from the number of serious accidents as a proportion of the total number of accidents (serious and minor) meat processing once again comes in first position, followed by industrial bread and biscuit making.

A study carried out in the major Paris market, in Rungis,¹ covered 1,980 persons who had had accidents and in respect of whom complete files existed enabling an in-depth study to be made. More than 90 per cent of these people were men, aged mainly between 20 and 50. The proportion of accidents was considerably above the average in meat products on the one hand, and in the butter, eggs and cheese branch on the other.

These two branches, in which large numbers are employed, had the highest accident figures, followed by the fruit and vegetables sector.

In prevention a distinction has to be made between the accident frequency in a particular branch in relation to that in other branches on the one hand, and the number of persons who may have to be treated on the spot or sent elsewhere for emergency treatment on the other hand.

In the distribution of food products and drinks, there is a high accident rate among those employed on handling. Other particularly dangerous jobs are those of butcher or driver-delivery man.

Etiological research makes it possible to determine the circumstances of accidents: the nature of the accident, objects handled at the time of the accident, etc. A large proportion of the more serious accidents occur in the following circumstances: falls (on level or uneven ground), the handling of objects, injuries in which the skin is pierced, the handling of meat carcasses, transport with palettes and cartons, moving objects, lifting devices and fork-lift trucks, vehicle maintenance and repair, hand tools, knives, cutting machines and road traffic.

Emphasis should be placed on the number of accidents that occur with hand tools, knives and other cutting or blunt instruments, and greater importance should be attached to vocational training from the preventive point of view and to improving job safety. Handling is dangerous not only for the worker but also for those around him. Frequently, in work of this kind, much is left to improvisation. It is striking to note that few cases concern the handling of live animals.

The cost of accidents

The cost of an accident is one way of assessing its severity. It is interesting to compare various branches of activity from this point of view.
Table 9: Unit cost of industrial accidents for various sectors of production, in Swiss francs, 1972 and 1977

<table>
<thead>
<tr>
<th>Sector</th>
<th>1972</th>
<th>1977</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal industry</td>
<td>923</td>
<td>1329</td>
</tr>
<tr>
<td>Watch and clockmaking</td>
<td>718</td>
<td>1180</td>
</tr>
<tr>
<td>Textiles</td>
<td>1061</td>
<td>1442</td>
</tr>
<tr>
<td>Chemicals</td>
<td>1703</td>
<td>2870</td>
</tr>
<tr>
<td>Food industry</td>
<td>1116</td>
<td>1486</td>
</tr>
<tr>
<td>Forestry</td>
<td>2382</td>
<td>3140</td>
</tr>
</tbody>
</table>

Source: Swiss National Accident Insurance Fund, Lucerne.

In the branches of activity compared in table 9, the food industry takes third position as regards the cost of an accident, for both 1972 and 1977. On average the 1977 cost is approximately 1 1/2 times that of 1972, a considerable increase which in no way reflects a change in the severity of industrial accidents but rather the increase in the price of health in general. For the same year, the cost increases according to the site of the injury: fingers, hands, upper limbs, lower limbs, etc.

The CNA studied the most direct causes of injury on the basis of the reports of the injured persons themselves and of witnesses of the accident.

Table 10: Relative frequency and average cost of accidents in the meat industry according to the cause, in Switzerland, 1977

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Cost (in Swiss francs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slipping, tripping</td>
<td>2631</td>
</tr>
<tr>
<td>Falls</td>
<td>8631</td>
</tr>
<tr>
<td>Stumbling over an obstacle</td>
<td>1101</td>
</tr>
<tr>
<td>Being jammed</td>
<td>2625</td>
</tr>
<tr>
<td>Cuts</td>
<td>1187</td>
</tr>
<tr>
<td>Animal bites</td>
<td>381</td>
</tr>
</tbody>
</table>

Source: Swiss National Accident Insurance Fund, Lucerne.

Slipping, tripping and falling

All statistics in all countries reveal the predominance of accidents caused by slipping, tripping and falling in the food products and drink industry.
A recent study examines the causes and circumstances surrounding accidents that are followed by serious injury and even death as a result of slipping, tripping and falling:

(a) slipping of one or both feet when friction between the shoe and underfoot surface is low or when the surface is contaminated with water, ice, oil, food scraps or small objects (a characteristic situation in the food industry);

(b) a trip or stumble which is a sudden arrest of movement of a foot with continued motion of the body; projecting flagstones, curbs, steps, stair nosings and objects on the floor frequently contribute to such accidents;

(c) twisting of the foot or ankle on an object or uneven surface;

(d) movement of the underfoot surface, for example a slide of a doormat, a roofing slate, a duck-board or a ladder, or tilting of a chair being used instead of a step-ladder;

(e) breakage of the underfoot surface such as floor-boards, duck-boards, asbestos roofs, etc.;

(f) missing a step (caused by lack of warning signs);

(g) stepping or falling into holes in the underfoot surface;

(h) collision with a person, animal or object causing loss of balance;

(i) loss of balance under the influence of alcohol;

(j) loss of a handhold from breakage of the support;

(k) collapse of a supporting structure.

All these causes apply to the food industry but it is the first two in particular that are responsible for the majority of accidents involving falls on the same level as a consequence of the nature and environment of work in this sector: greasy, wet or icy floors, meat scraps, etc. As is emphasised by Strandberg in connection with the "human factor", a more thorough analysis of an industrial accident will reveal the part played by the environment even in cases of falls on the same level: poor visibility (ill-lit passageways, corridors and store-rooms or poor visibility caused by an obstacle), slippery floors, poor design of equipment and machinery (see below), excess workload.

**Accidents with powered industrial trucks**

Powered industrial trucks, which are commonly used for transporting and handling goods in the food industry, can be involved in very serious, even fatal accidents.

For the whole of France, Sonod et al. recorded 9,240 accidents with absence from work, 1,025 accidents with permanent incapacity for work and 24 fatal accidents caused by these trucks.
Their analysis of the situation reveals that moving an industrial truck in a workshop involves the operator (thought should be given to his vocational training, knowledge of the vehicle and of the workplace), the vehicle itself (which should be selected in the light of the work to be carried out, its maintenance and guarding), the work to be performed (quantity of goods to be moved, distances to be covered) and the environment (workshop with possible obstructions, unevenness of the floor, activities carried out, etc). This multi-faceted analysis, which has become standard in etiological research into industrial accidents, gives rise to a complex strategy for prevention, as will be seen below.

Accidents with refrigerated or isothermal vehicles

The transport of food by refrigerated vehicle has become a world-wide practice. With it has arisen a new category of risks described, for example, by the French National Institute for Safety Research (Paris) in 1983.

Workers who handle and transfer goods carried by refrigerated or isothermal vehicles are exposed to the following risks:

- slipping and falling outside or inside the vehicle (caused by the frozen floor);
- jamming of limbs between the goods and obstacles such as the wall or food rack;
- crushing of limbs (particularly the legs) by a fall of heavy and slippery packages;
- injuries caused by falling against hooks (especially meat hooks), defective roll containers, or badly packed goods;
- back pain caused by carrying loads that are heavy, bulky or awkward to carry (a distinction should be made between symptoms that appear suddenly during the handling and chronic symptoms that should be recognised as cases of occupational injury);
- death by freezing or asphyxia when the doors have been accidently closed.

It should not be forgotten that some of these risks are shared by those who work in non-mobile refrigerating plants, such as those for the preservation of meat. Injuries caused by meat hooks also concern workers in abattoirs.

The drivers of controlled-temperature vehicles with refrigerating plants have often been subject to the following risks: falls when operating the refrigeration controls or in the course of checks, adjustments and maintenance; being jolted against the refrigeration controls when these are badly placed in the cabin (for example behind the driver's head); deafness caused by the noise inside the cabin; disorders such as loss of concentration, delayed reflexes caused by the noise and vibration of the vehicle.

The last-mentioned disorders are aggravated during night driving or in the early hours of the morning. The occupation of carrier in the agricultural and food sector deserves a study to itself: night driving, the
need to deliver the load in time (for example milk for cheesemaking), long drives over what is often difficult terrain (collecting milk in alpine pastures), in all weathers (snow, rain, icy roads), often alone at the wheel (daily milk collection), vehicles that are very heavy when fully loaded.

Wrapping and packaging

For reasons of hygiene and to ensure that it keeps, as well as to facilitate its distribution, food is often preserved - in cans, bottles, plastic bags, etc.

Most accidents involve the use of machinery for filling, wrapping and packaging. Bottling equipment appears to be the most dangerous (conveyor belts, crating, capping devices and labelling machines) followed by canning equipment (conveyor belts and machines for lid sealing).

It has been found that these accidents have mostly involved machines in the course of operation: the worker has tried to remove something in the way (a piece of glass, paper, cap, etc.) or may have tried to clear the machine, to remove dirt from a piston, or have tried to clean the machine when it was working. Such operations, which are particularly dangerous, also occur in the wrapping of other products such as soap.

In packaging in cans or bottles, food products may undergo sterilisation in vacuum pans: there is then a risk of explosion of the vacuum pan and of scalds from pressurised steam.

In addition to these various accidents caused by machines, food preparation and canning entails other risks such as falls, either on the level or on uneven ground, made all the more likely by a wet or greasy floor. The risk of accidents with electricity are heightened by a damp atmosphere; in addition to these specific accidents are the traditional ones of mechanical origin (driving belts, bars and shafts).

The type of injuries sustained by packaging workers are, in order of frequency, cuts, amputations, fractures and bruises.

The main site of these injuries is the right hand, then the left hand, followed by the arms, the legs, and the trunk.

Pre-packed food and meals have become popular and there is likely to be an increase in the number of persons employed on packaging; special attention should be paid to the design and maintenance of their work stations. In this connection the growing use of micro-wave ovens is a further source of concern.

Notes


3 L. Strandberg: "On accident analysis and slip-resistance measurement", in ibid., pp. 11-32.


CHAPTER III

OCCUPATIONAL DISEASES

Infectious diseases (zoonoses)

Animals may be affected by a wide variety of infectious or parasitic diseases whose causative agents may also give rise to disease in man. Transmission may occur through direct contact with the animal or with animal products (meat, untreated milk, hides etc.), and also, although more rarely, through contact with vegetable matter (e.g., in sugar production) contaminated by the excreta of infected animals. It frequently happens that the animal itself shows no overt sign of disease, being a healthy carrier of the infectious or parasitic agent.

Diseases of animal origin (zoonoses) are not only occupational diseases of the food industry but are mainly found among workers in contact with animals (agriculture, hunting, veterinary services) and may also affect other persons, in particular those who consume contaminated food products (for example, unboiled milk or uncooked meat).

The following are the most important diseases of animal origin:

Brucellosis

There are three species of micro-organism of the genus Brucella that are pathogenic for man. Most cases of brucellosis are caused by Brucella abortus, which is transmitted by cattle and, more rarely, by horses or dogs. Although the disease is found throughout the world it is most prevalent in northern and central Europe and in North America. Brucella melitensis is transmitted by goats and sheep, and is particularly prevalent in the Mediterranean area. Brucella suis is transmitted by pigs, but human disease caused by this agent is uncommon.

The disease is generally contracted by direct contact with an infected animal. Recurrence after treatment is not uncommon in the event of a new contact, and in the case of prolonged exposure the disease may become chronic.

In man, the disease produces a very variable clinical picture:

- subclinical infection, when the presence of the disease is revealed by serological tests;
- acute infection, resembling an attack of influenza;
- subacute infection, marked by repeated attacks of fever (undulant fever) and various localised symptoms, such as arthritis of one or more sites, meningeal involvement etc.;
- chronic infection, which may affect different organs; the resultant asthenia of physical or sometimes psychological origin is associated with symptoms related to the sites of the various foci of infection; the bone structure is often affected (spondylitis, etc.).
Prevention is principally a matter for the veterinary profession although immunisation may be considered for workers at special risk.

**Anthrax**

The causative agent of anthrax infects cattle, sheep and other animals, in which it may cause epidemic outbreaks. Anthrax may be contracted by butchers and workers handling hides, bones or animal carcasses; workers who manufacture animal foodstuffs may also be affected.

From the clinical standpoint, cutaneous anthrax is the form most frequently seen (vesicle at the point of contact - generally the hand - which later develops into a pustule); pulmonary and intestinal anthrax is less common.

Prevention is principally a matter for the veterinary profession through inspection of products from areas where anthrax has not been eradicated; immunisation of workers at risk plays a major part in prevention.

**Leptospirosis**

The most severe form (icterohaemorrhagic fever) is caused by *Leptospira icterohaemorrhagiae*, the vector of which is the rat. The pathogen is transmitted by the urine of infected rats. Other leptospiral species, producing less severe symptoms, are found in the rat too but also occur in the mouse, pig and dog.

The most common form of the disease, icterohaemorrhagic fever, may cause renal, cardiovascular, ocular and neurological complications.

Although leptospirosis responds well to antibiotics, it remains a severe and sometimes fatal disease. For this reason the immunisation of persons at special risk should be encouraged. A trial carried out recently on 800 sewermen in Paris showed immunisation to be both safe and effective. Its application to certain workers in the food industry might be considered. In a study carried out in New Zealand on 1,215 meat inspectors and 1,248 workers in the meat industry, immunological tests were found to give particularly high titres in persons exposed to infection during the slaughtering process and showed the handling of pigs to be the most dangerous activity. Despite the occurrence of leptospirosis in the meat industry, it should not be forgotten that the risk of contracting the disease is three times higher among livestock workers.

**Tularaemia**

Rodents, particularly hares and wild rabbits, form the reservoir of infection. Although epidemics are uncommon, they have been reported among sugar factory workers handling beets that have been contaminated by animals.

**Tuberculosis**

Cattle may be carriers of the organism *Mycobacterium bovis*, and poultry carriers of *Mycobacterium avium*; the latter is rarely the cause of disease in man.
Mycobacterium bovis infections affect workers engaged in the slaughter, processing and sale of livestock and meat; the number of cases go down as the incidence of the disease declines among livestock. It occurs in various forms and may involve the skin, the lymph nodes, the bones and joints, and the lungs.

Ornithosis

This disease is caused by organisms that infect pigeons, turkeys, ducks and hens. Epidemics have been reported in slaughterhouses; grippe and typhoidal forms of the disease are observed, frequently accompanied by bronchial pneumonia and, more rarely, other complications.

Preventive measures involve the selection of poultry before slaughter and the treatment of infected animals.

Skin disorders of viral origin

Livestock susceptible to the virus concerned are the source of these disorders. Transmission takes place almost entirely by the cutaneous or mucosal route and the lesions occur principally on the hands and forearms although they may also appear on the face and more particularly the lips. The presence of a minor wound is sufficient for man to be at risk from contact with the highly infectious lesions of the animal or the serous fluid or exudates from such lesions.

The occupations at greatest risk are those of livestock workers and dairy workers, but slaughterhouse workers may also be affected, as may butchers and pork butchers.

The viruses involved belong to the poxvirus or paravacciniavirus group (in cattle), the orf-virus group (in sheep) or the foot-and-mouth disease group (in cattle and pigs). The course of the infection in man is marked by the appearance at the point of inoculation of macules which turn into vesicles and pustules with involvement of the lymph nodes; sometimes the skin lesions have the appearance of small tumours. Generalised symptoms of infection (high temperature, etc.) occur in some cases but not in others.

Erysipeloid (swine erysipelas)

The organism Erysipelothrix infects pigs and fish. All slaughterhouse workers are at risk from the disease, which takes the form of a single, sharply demarcated lesion of a redish-blue colour causing a characteristic pain that is increased by pressure and heat, this being a skin condition that produces a feeling of burning but not itching.

Epidermomycosis

Fungi of the genus Microsporum are parasitic on the skin of animals and may be transmitted to man, in whom the disease takes the form of a brownish patch with erythema and blistering. Its incidence is highest among livestock workers but slaughterhouse staff may also be affected.
Toxoplasmosis

Toxoplasma gondii may be carried by livestock and cats. Rare cases of occupational infection as a result of handling meat from infected animals have been reported. The disease follows a chronic course and may involve the glandular system, the eyes, the nervous system, etc. Pregnant women and the human embryo are at special risk from toxoplasmosis.

Respiratory diseases

Chemical substances in the form of gases or vapours, and material of vegetable or animal origin present as aerosols in the air of the workplace in the food industry may produce harmful effects on the respiratory system, the most important being irritant, allergic or immuno-allergic effects. The respiratory system is also a portal of entry for the causative agents of the infectious diseases discussed earlier.

Irritant effects

Irritant gases produce inflammation of the mucous membrane of the respiratory tract and may lead to rhinitis, pharyngitis, laryngitis, bronchitis (pain, cough) and possibly, bronchopneumonia or pulmonary oedema. In the food industry, such effects may be produced by sulphur dioxide (SO2) or ozone used as bleaching, preserving, deodorising or sterilising agents.

Repeated exposure to non-irritant concentrations is suspected of causing disorders of pulmonary function. Similar effects are produced by exposure to high concentrations of dusts originating from food products, such as tea. In cod-drying plants there is found to be a high incidence of respiratory disorder caused by the inhalation of aerosols (containing salt), by cold and by damp air.

Allergic effects: occupational asthma

Occupational asthma is characterised by paroxysmal dyspnoea during or at the end of the work period, caused by bronchospasm and mucosal secretion. The dyspnoea dies down after work is over and begins again when it resumes. Allergic symptoms may also affect the upper respiratory tract (spasmodic rhinitis, sometimes accompanied by conjunctivitis). The allergic reaction may be caused by organic substances of vegetable or animal origin or by chemical substances of more recent introduction into the food industry.

Among vegetable products, flour and cereals have long been known to cause asthma in millers and bakers. There are many antigens capable of provoking asthma, such as flour, pollen, moulds and insects. Other types of products may also be incriminated, such as linseed meal used as cattle feed, ground-nuts, rape-seed, etc. Asthmatic reactions of animal origin are produced by superficial parts of the body, such as hair, nails and fur, and animal parasites. Cases of asthma may also be found in the fishing industry, for example among workers processing crabs.

The new technique of selling pre-packed products has caused a condition that is now being widely studied and has even received a name, "meat worker's asthma". The meat-packer's job is to place portions of cut meat in...
cardboard trays that are then covered in plastic foil to which a label giving the weight and price is attached. A common feature of the machines used in such work is that they generally use thermal welding to cut the plastic foil. It was not until 1973 that English speaking authors noticed respiratory disorders among meat-packers. Since then an increasing number of cases have been reported.

**Course of the disease**

The symptoms at the outset are those of a virus disease of the lung, with irritation and watering of the eyes, rhinorrhea, sneezing, dry throat and difficulty in breathing. It is typical of these disorders that they appear after work has begun and become worse by the end of the week. They disappear during the weekend or during holidays. In a third of cases, acute attacks of asthma occur either at work or at home.

After a study of 22 meat packing shops, Pauli (1982) was inclined to lay the blame not so much on the plastic foil (polyvinyl chloride - PVC) as on the heat-adhesive labels. Different products were released when the labels were attached: on the one hand, epoxified soya-bean oil, plastifier and heat-stabliser from the PVC and, on the other, the phthalic anhydride contained in the labels. These are quite likely to be responsible for the immunological reaction.

A recent practice has been the use of papaine to tenderise meat and to clarify beer and other drinks, and it is now available in the form of an aerosol spray. Cases of asthma due to papaine powder have been reported.

In other words, the increase in the number of cases of occupational asthma in the food industry calls for a review of the medical surveillance provided for workers at risk. In the case of these respiratory disorders it is recommended that persons at special risk such as those suffering from respiratory insufficiency or allergies should not be recruited.

Medical decisions regarding patients are not easy either. In the first place, even though the tendency in a case of asthma is towards recovery, prolonged exposure with recurrence of attacks may ultimately lead to the establishment of a chronic inflammatory state complicated by secondary infections and resulting sooner or later in irreversible obstruction. There is no point in desensitisation unless it is carried out with the causative agent, so that in most cases the medical verdict is in favour of a change of work or, better, a change of workplace.

**Immuno-allergic effects: extrinsic allergic alveolitis**

This condition is also, in principle, caused by response to an antigen, but is accompanied by cell proliferation in the alveolar septa and severe impairment of pulmonary function. It was first recognised in farmers exposed to dust from mouldy hay (farmer's lung) but has been identified as a disease of other occupations, including the food industry. Workers at risk are cheese-makers (where the role of mites in the disease has been considered), malt workers and fish processors (where the agent is fish protein).
A wide variety of skin disorders are found among workers in the food industry and affect many areas of production. Skin complaints caused by zoonoses have been dealt with in the section on infectious diseases.

**Heat-related disorders**

Bakers (oven workers) exposed to the heat of ovens may suffer burns and develop patches of brown pigmentation on exposed areas of skin.

Workers in refrigeration plants, who are exposed to cold, are subject to chilblains on fingers and toes (smooth, localised, distended reddish swellings) that may ulcerate and become very painful.

**Occupational dermatitis**

Most skin disorders are due to direct contact between the causative agent and the skin. The agent may have an irritant (for example, acids, alkalis, grease solvents: irritant dermatitis) or allergenic (allergic dermatitis, eczema) effect. In acute conditions the skin is oedematous and red with the formation of papules, vesicles or bullae. Chronic dermatitis is characterised by lichenification and cracking. Prolonged contact with water and grease solvents or the use of harsh cleaning agents (detergents, certain soaps) may facilitate the development of skin disorders or aggravate existing conditions. Allergenic properties have been attributed to many substances and materials met with in most jobs in the food products industry. Such substances include cereals, flour, fruit, vegetables and vegetable juices, spices and essences, etc. Fruit and vegetables may carry moulds, parasites, pesticide and antibiotic residues etc., which can also act as allergens.

Surveys of the incidence of occupational dermatosis have come up with some startling figures. Three to seven per cent of workers in the sweetcorn canning industry at some time develop dermatosis of the hand and forearm, twice the rate in the potato industry (Seligman and Kay, 1968).

Dermatitis, and more particularly allergic dermatitis (eczema), is a major problem. If contact with the offending agent is not eliminated, the eczema will persist and often get worse.

Sensitisation may occur after lengthy exposure to small quantities of an allergen. As in the case of respiratory allergies, identification of the agent responsible for a skin allergy is a very complex procedure. For example, in the flour-related eczemas affecting bakers, Heine and Fox (1980), after chemical analysis of several types of flour, came to the conclusion that it was the chromium compounds, present in only trace concentrations as compared with the other substances, that were possibly responsible for the lesions, as in the case of cement eczema.

From the workers' point of view, the fact that the occupational cause of their condition is unknown has a number of harmful repercussions: pointless sensitivity tests, unsuitable therapy, failure of insurance schemes to recognise the condition, no proper preventive measures.
Skin diseases of infectious origin

Contact with the sweeter varieties of fruit facilitates the development of periungual inflammation of the fingers, the causative agent being Candida (monilial) albicans. In general, mycoses and pyoderma occur fairly frequently among canny and meat industry workers.

Warts are benign epithelial tumours of the skin caused by a virus. The hands are most usually affected. Although the condition is not a serious one, it has attracted attention from virologists. There are a number of findings showing a high prevalence of warts among meat handlers (butchers, poultry slaughters).

Recent findings have shown that epidemic outbreaks of streptococcal infections have occurred in pig and poultry slaughtering establishments, but the mode of transmission has not been identified.

Insect stings

Stings from wasps and bees attracted by food are a minor hazard that nevertheless call for the provision of first aid and preventive measures.

Chemical hazards

Even though the environment seems to be one where such hazards are uncommon, cases of chemical poisoning may occur. For example, the extraction of olive oil calls for such solvents as trichloroethylene or hexane. In a study of workplaces carried out in Italy, analysis of the air found ethylene trichloroethylene concentrations in excess of accepted standards, and, in addition, the presence of benzene in excessive amounts.

Carbon monoxide (CO) may be generated in grain silos, wine fermentation cellars or in places where various products such as fish are stored (National Safety Council, United States, 1980). It has been found from the results of blood tests that brewers are exposed to high concentrations of carbon monoxide. Irritant substances have already been dealt with earlier.

Accidents may be caused by low oxygen levels in wine cellars. During the alcoholic fermentation of musts large quantities of carbon dioxide (CO\textsubscript{2}) are produced, displacing some of the oxygen in the air. Carbon dioxide has a mild toxic effect and causes dizziness, headache, excess sweating, nausea etc., which may precede loss of consciousness. This hazard is well known and accidents are increasingly rare.

In wine storage tanks, whether full or empty, oxidation reactions may take place between residues and certain tank components with a resultant lowering of oxygen levels in the air.

When wine is being decanted, natural oxidation of the alcohol may take place under the action of aerobic yeasts to yield acid (the wine turns to vinegar). To prevent this reaction, oxygen is replaced by an inert gas (such as nitrogen), so that as the tank is emptied of its wine the space is taken up by the inert gas. Many accidents have been reported during the cleaning of such tanks when full of an inert gas and completely devoid of oxygen.
Great vigilance is needed where reduction of the oxygen content of the air may occur since the symptoms it produces are not very noticeable: slight disturbance of breathing and heart action, lips turning a blueish colour. Loss of consciousness, which occurs when the level of oxygen in the air falls below 12 per cent, may take place without warning. This is an insidious and very serious hazard for persons cleaning wine tanks.

Prevention involves recourse to a more modern design of wine cellars with provision of adequate ventilation, first-aid equipment and first-aid training for staff. The proper briefing of those responsible for purchasing equipment is as essential here as elsewhere.

Occupational exposure to alcohol must be considered as a hazard. Consumption of alcohol is a necessary part of the work of chefs and wine-tasters.

The job of the wine-taster is, by tasting without swallowing, to select wines (or other alcoholic beverages) according to predefined quality standards. Such tasting is carried out in the laboratory or in the wine making establishment and is repeated many times a day. One study found that even though the tasters do not drink, tasting without swallowing allows some of the alcohol to pass in perfectly measurable and not inconsiderable amounts into the bloodstream.12

Another aspect is the possibility of habituation to a high intake of alcohol. Among other factors, the consumption of alcohol is known to be encouraged by the ease with which alcoholic beverages may be obtained. In this way workers in breweries and wine making establishments are often tempted to drink on the job because they are allowed to help themselves to a certain amount of drink and consume it on the premises. Again, certain occupations in the food industry involve prolonged exposure to heat (near ovens, in kitchens, etc.) with consequent dehydration and thirst that is often slaked with alcoholic beverages (wine and beer).

Not enough work has been done to show whether, under these conditions, alcohol has a significant impact on health (with respect, for example, to accident rates, the prevalence of chronic alcoholism or diseases caused by alcohol).

### Dental caries

Bakers, confectioners, pastry-cooks and sugar-plant workers may be affected by dental caries but the preventive measures made available by modern dental practice have greatly reduced the significance of the phenomenon. However, the authors of a survey carried out in the Federal Republic of Germany in 1975,13 found that of 1,016 cases recorded, 90 per cent came from those occupations while the remaining ten per cent came from various industries in which workers were exposed to inorganic acids.

#### Notes


9 R. Brignardello, F. De Luca and G. Spagnoli: "Environmental pollution due to industrial solvants used for the extraction of olive oil from pressed oilcake" in Securitas, Rome, 1973, No. 58, pp. 49-60.


11 Ch. Lemaire and B. Sanchez: "Risques d'accidents respiratoires et leur prévention dans les caves vinicoles" in Revue des conditions de travail, Marseilles, 1983, No. 6, pp. 31-33.


CHAPTER IV

ADVERSE EFFECTS OF THE PHYSICAL ENVIRONMENT - 
ROTATING SHIFT WORK

Adverse effects of the physical working environment

Noise

A noisy environment is typical of some workplaces in the food products industry. It should be recalled that the acceptable limit for an eight-hour daily exposure to industrial noise is set, in most countries, at 90 dB(A), which does not, however, imply that permanent exposure to this noise level does not impair hearing. Other problems can also arise at the same level, affecting the nervous system, the cardiovascular system or the gastro-intestinal tract.

The food-products packing workshops are undoubtedly the noisiest workplaces in this industry, where the overall noise level very often exceeds 90 dB(A).

Bottling, whether of beer or other drinks, is responsible for many sources of noise, such as: the washing of bottles, filling and sealing, packing and polishing. The number of bottles filled in undertakings can range from 5,000 to 70,000 bottles per hour and cases of hearing impairment have been noted amongst workers.

Conveyors transporting bottles between the various packaging centres are responsible for noise levels exceeding 90 dB(A), as they produce a background noise accompanied by the clinking of bottles knocking together. Noise prevention should therefore be geared towards reducing the clinking of bottles and the speed at which they are transported, by modifying the design of conveyors.

The harmful effect on hearing of the noise caused by bottle-filling is increased by the fact that these are noises of impact. It is not surprising that there are cases of occupational deafness; the problem needs to be tackled by reducing noise at the source, instead of having recourse to individual measures of protection.

Cold

Many operations in the preparation of foodstuffs require a cold environment.

This is especially true in the case of meat processing and packaging. In temperatures ranging from 4 to 11 C, which is typical for these workplaces, it has been noted that the skin on an individual's hands drops from 30 to 20 C in two hours. Measures can be taken to combat the cold by reducing air speed, heating seats, insulating the handles of tools and protecting workers with suitable clothing. Rapid changes of temperature can also cause a problem: for example, for persons delivering deep-frozen products.
The use of cold rooms constitutes another problem. Reactions to cold vary considerably from one worker to another, especially with respect to peripheral cooling (hands and fingers); discomfort thresholds also vary considerably depending on the individual.

Exposure to cold in warehouses can cause chronic health conditions. In a deep-frozen food factory in Italy, temperatures of between \(-20\) and \(-38\) \(^\circ\text{C}\) were noted and, consequently, the following complaints were frequent amongst workers: chronic pharyngitis, osteo-articular impairments, disorders of the digestive system and a reduction in psycho-motorial reactions. It was suggested that these effects might be overcome by providing the workers with protective clothing and by allowing them rest periods in warm areas, as well as by making improvements in the workplaces themselves.\(^5\)

**Combination of harmful factors in the meat industry**

Three surveys have been carried out on the meat industry which are very interesting from two points of view. First, they apply the participation approach, which takes into account the workers' opinion on working conditions and their possible improvement. Second, the authors have compiled statistics on the replies workers gave to questions put to them, either in the form of a questionnaire or during an interview, to identify the points which should be examined by the safety engineer or those organising the work. This is the first step in the application of occupational safety and health management methods which will be discussed later in the text.

The first survey was carried out in Sweden in 1970.\(^6\) The results can be summarised as follows:

- about 50 per cent of workers consider that risks of injury at their workplace are high;
- 60 per cent consider that the loads they have to carry are too heavy;
- 76 per cent are bothered by the noise;
- 58 per cent suffer from draughts.

Furthermore, the temperature is considered to be too high or too low, depending on the particular job, but very rarely comfortable. Those carrying out the survey, comparing the meat products sector with other industries, believe that the first problems to be dealt with are the following: the temperature of the working environment, air pollution and noise. However, lighting problems are only minor.

The second survey was carried out in Quebec and covered poultry factories.\(^7\) As in the previous case, workers gave their replies by filling in a questionnaire. The replies were as follows, in decreasing order or importance:
<table>
<thead>
<tr>
<th>Harmful element</th>
<th>Frequency rate (as a percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- wet or slippery surface</td>
<td>77</td>
</tr>
<tr>
<td>- noise</td>
<td>73</td>
</tr>
<tr>
<td>- damp atmosphere</td>
<td>66</td>
</tr>
<tr>
<td>- cold</td>
<td>49</td>
</tr>
<tr>
<td>- pace of work too fast</td>
<td>45</td>
</tr>
<tr>
<td>- smells</td>
<td>30</td>
</tr>
</tbody>
</table>

Workers in slaughterhouses complained of the following disorders:

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>- muscular backpains</td>
<td>73</td>
</tr>
<tr>
<td>- pains in legs</td>
<td>62</td>
</tr>
<tr>
<td>- pains in arms</td>
<td>47</td>
</tr>
<tr>
<td>- pains in the shoulders</td>
<td>41</td>
</tr>
<tr>
<td>- nervous tension</td>
<td>58</td>
</tr>
<tr>
<td>- general tiredness</td>
<td>68</td>
</tr>
<tr>
<td>- headaches</td>
<td>48</td>
</tr>
<tr>
<td>- difficult digestion</td>
<td>3</td>
</tr>
</tbody>
</table>

These different symptoms are characteristic of activities common to other industries, but the effects of which are aggravated by the working environment; these are monotonous and repetitive activities, requiring rapid and unvarying movements of the hands and arms, carried out in a standing position without support. Time measurements showed that some work cycles only lasted a matter of seconds and that some gestures were repeated every second. Furthermore, it was noted that the majority of workers were obliged to remain standing without ever moving from their place. Opportunities for stretching their leg muscles were rare since workers were not even allowed to go to the lavatory as and when they wished.

There are considerable hazards of falling because the ground is wet and, more often than not, soiled by washing water, chicken excrement, blood and gall.

The third survey is French and covers meat and dairy industries which employ a total of 130,000 workers.

Workers in the meat sector suffer particularly from time constraints arising from a fast rhythm of work and unduly short work cycles, as well as from the fact that they have to remain standing too long. Next on the list of their complaints is the working temperature, especially the cold combined with dampness. Finally, sickening smells are specific problems in this industrial branch of activity.

**Electricity**

The risk of electrical accidents is particularly high on food processing lines because of the machinery and is further increased by the dampness of the ground and the workers' hands.

Furthermore, in order to be able to sell the meat as soon as possible after slaughtering, there is a technique which consists of carrying out an "electrical stimulation of carcasses". The electric current is used to cause muscular contractions, thereby speeding up the biochemical transformation of
muscle into meat. This tenderising process makes it possible to refrigerate the meat more quickly and thus improve its quality.

The stimulation technique uses either high- or low-voltage currents and special precautions must be taken to eliminate any risks of electrical accidents wherever the stimulation process is taking place.

**Ionising radiations**

Irradiation is a new technique for preserving food products which is becoming increasingly widespread.

**Non-ionising radiations**

There may be a specific hazard of exposure in the use of micro-wave ovens if these are of faulty construction or used in abnormal conditions.

**Rotating shift work**

Many studies have been undertaken on the harmful effects of rotating shift work. This type of shift work, considered to be the most tiring, consists of three shifts working eight hours alternately on mornings, evenings or at night; they can also alternate on a daily, weekly or monthly basis as the case may be. Night work is less common in the food industry than in other production sectors.

According to a study recently carried out in this industry, rotating shift work is almost exclusively reserved for male workers (96 per cent of workers on this schedule are men), although night work is equally divided between both sexes.

Compared with day workers, night workers and shiftworkers showed a higher frequency of sleep disturbances, and of intestinal tract and appetite disorders. The latter are naturally linked to the fact that eating habits are completely disrupted as shiftworkers do not eat at the same time as or with other people.

However, the higher frequency of accidents amongst rotating shiftworkers is even more disturbing.
Percentage of male and female shiftworkers having one or more injuries in a six-month period

<table>
<thead>
<tr>
<th>Sex</th>
<th>Shift</th>
<th>Day</th>
<th>Afternoon</th>
<th>Night</th>
<th>Rotating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td>18</td>
<td>26</td>
<td>15</td>
<td>38</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td>22</td>
<td>12</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Combined</td>
<td></td>
<td>19</td>
<td>22</td>
<td>16</td>
<td>39</td>
</tr>
</tbody>
</table>


On the other hand, the types of injury sustained are typical of the food industry for all groups of workers (although the undertakings are not actually specified, they are apparently meat factories): at the top of the list are superficial injuries and open wounds, followed by contusions and then sprains; injuries caused by falls and burns are right at the bottom of the list.

Notes


CHAPTER V

PREVENTION

Introduction

Occupational health and safety statistics show that the food industry, at least in some production sectors, remains a dangerous one. Moreover, it must be stressed that minor accidents are not generally reported and thus are not included in the statistics. Cases of occupational disease are in general widely underestimated: the physician is unaware of the occupational nature of the disease, which is treated like an ordinary illness so that in the end its occupational characteristics are no longer apparent, sick workers fail to consult the physician etc. Moreover, in most countries, a disease is considered occupational only if it appears on a list of recognised illnesses. Workers are exposed in a more insidious way to a number of other occupational health risks: excessive postural, sensory, mental, or muscular demands leading to disorders of varying gravity. To these may be added health problems resulting from lack of job satisfaction, fatigue, faulty installations and unsatisfactory work organisation. These facts make it essential for preventive measures to be taken to protect workers' health.

In the food industries prevention can be conceived firstly along traditional lines, such as protection from machines, personal protective clothing and equipment and the improvement of the working environment. Such measures, although indispensable, are not sufficient. Ergonomics makes it possible to set these measures in a wider framework where the job content and load are examined critically. A preventive system aiming to remedy a situation which in itself is dangerous will therefore be replaced by a system specifically designed to reduce the harmfulness of the work situation.

Guarding of machinery

The ILO report on health and safety in the food products and drinks industries published in 1963 remains an excellent reference in this connection. The main points of the report are summarised below.

Meat canning and salting

Forming: "Hams" are reconstituted by a press. The pieces of meat are placed in a mould and shaped by compressed air or hydraulic presses. There is still a danger that operatives' fingers may be crushed. The adoption of a "drawer" feed system and the placing of a fixed screen which makes it impossible for an operative to insert his hand between the mould and the press plate ensure protection against this hazard.

Grinders and mixers: Protection should take the form of a locked lid to prevent operatives from inserting their hands and arms into a machine in operation.
Stuffing machines: These machines stuff meat into sausage skins and comprise an enclosed hopper from which the paste is expelled by a screw or roller. There must be a safety device to cut off the compressed air when the lid is opened in order to ensure that the roller cannot fly off.

De-rinding and slicing machines: Several types exist. In the case of rollers on to which the bacon is pushed forward, a stop device similar to that on a wood planing machine can be placed in front of the blade to prevent the operatives' fingers being caught.

It should be noted that in most cases work on these machines is carried out in a standing position on a greasy floor; in addition to the improvement of machines, safety demands that either seats or various support should be designed to enable the worker who must apply pressure or sustain a load to do so by leaning on this support rather than on the piece of meat. It is the actual design of workplaces in the meat sector which needs to be reconsidered.

**Vegetable canning**

Pea-shelling machines: Guarding requirements are as follows:

- all transmission parts must be enclosed;
- solidly fixed platforms should be installed and provided with firm guard rails;
- the stand should be earthed if the equipment is electrically operated etc.

In general all equipment should be designed in such a way as to ensure that operatives cannot fall on to moving parts or be caught in them.

Cutting machines: A basic recommendation is that all cutting parts must be entirely closed. It should be noted that machines operating constantly are less dangerous than those which are used only on rare occasions (faulty maintenance, defective memory of operators, frequent incidents typical of seasonal work). Moreover, the most dangerous part is the maintenance and repair of machines during use. It is therefore not enough to purchase a machine which conforms to safety regulations and install it properly; its use must be constantly supervised.

Cooking: In all cooking operations, the risk of burning or scalding is present (contact with the hot parts of machines or contact with steam). Protection concerns two aspects: the machines themselves and the extraction of steam and vapour. Micro-wave ovens may also in certain cases involve the problem of exposure to non-ionising radiations.

**Bakeries**

Kneading machines: Whatever machine is used, there is the risk of an operative's hands or forearms being caught or crushed between the mobile arm of the machine and the wall of the vat when he attempts to take a sample of dough or tries to scrape the machine while it is in operation. For this reason a cover must be placed over the danger area which is locked when the machine is in operation. In some cases a guard rail should be installed to prevent falls.
Breweries

A large number of accidents occur in the bottling department despite increasing mechanisation and automation which tend to reduce the number of such accidents (without however reducing the workload).

As in all maintenance operations, all moving parts must be guarded, the number of push-button devices to cut off conveyor belts must be increased, screens must be installed to guard the nipping points of the conveyor belt, overhead walkways must be constructed and devices installed to protect workers from glass splinters at the racking machine, etc.

Sugar refineries

Washing, weighing and grating: This sector is the most dangerous as regards accidents. Grid walkways with handrails and fencing that are easy to maintain must be installed to prevent falls; provision should also be made for the guarding of screw conveyors; the guarding of transmission parts is essential. The same recommendations are applicable to other dangerous installations which exist in sugar manufacture and refining.

General recommendations

The following recommendations can be made for the guarding of machinery:

- the establishment of a precise schedule of duties and insistence on the use of machines and installations which conform to national or international standards;

- the analysis of the recommendations used as a basis for practice in different countries when they concern standards resulting from scientific research on materials;

- the establishment of a multi-disciplinary team within or outside the undertaking, depending on its size, to study the entire problem of safety: installation, materials, organisation of work, training of staff, communications along the production chain etc.; in fact a team comprising workers, representatives of management, occupational physicians, ergonomists, safety engineers etc.;

- during the assembly of the plant, use of models which accurately reflect the production process and which make it possible to identify critical incidents and to test training methods;

- after the start-up of the plant, the continued testing of training by the application of appropriate criteria (for example, study of incidents, interviews with staff concerning workloads, psycho-physiological measures, etc.).

Although this approach would seem to be appropriate only to new installations, it can in fact be applied equally well to old ones that are being modernised, since the problem of safety is never definitively resolved.
Individual means of protection

When it is not possible to attenuate or eliminate risks at their source by protective measures concerning equipment and machines, individual means of protection become a necessity. Consequently these means must be the subject of ergonomic studies to make them comfortable, effective and compatible with the demands of productivity. It sometimes happens in undertakings that there is reluctance on the part of workers who must use such equipment. In a number of cases this reluctance may be due to defects in the material. In several countries there are institutions for evaluating personal protective equipment and reporting on its defects and advantages to help employers to choose between suppliers and products, bearing in mind that attention must also be paid to the psychological aspects of using such equipment.

As regards the food industries, two types of individual means of protection can be distinguished; those which are specific to the activities of the sector and those which can be used in industrial work in general and which may be beneficial to the sector.

The present section concerns only the first category. The second category includes items such as ear-plugs or ear-muffs for protection against noise.

It is above all in the meat sector that individual means of protection are of a special nature. This is due firstly to the handling of sharp and blunt instruments and secondly to the slippery nature of the damp, frosty or soiled floor.

As regards protection against the blades of knives, saws and other instruments, aprons, gloves and over-sleeves are available on the market.

From the ergonomic point of view, it is true that in addition to resistance to perforation, other characteristics of aprons should be taken into consideration such as shape, weight, ease with which they can be attached to shoulders and waist, range of available sizes, the way they fit the anatomy of the operative, and in certain cases, their aesthetic qualities. However, in the meat industry, another characteristic must be taken into account: the ease with which the material can be cleaned.

The same is true for protective gloves. Pieces of meat and grease may stick to the mesh with the risk of harbouring germs which contaminate meat as well as keeping the hands, which are already constantly in a damp environment, in contact with these contaminating elements.

Another area which has been the subject of a number of technical tests and very complex research is that of protective footwear.

The study of industrial accidents has shown the greater frequency, especially in the meat industry, of falls on flat surfaces or from one level to another than other floor-related accidents. The question which must be asked is therefore twofold: how can floors be maintained so as to make them less slippery and which footwear should be worn to ensure the best grip?

Certain parameters affect the stability of the body: the standing position is a stable one provided that the body's centre of gravity is situated above the surface of contact between the feet and the floor; if the centre of gravity moves outside this zone the person loses balance and starts to fall. Relative stabilities are reduced in proportion to the weight of the
load carried and the height at which it is carried. For example, carrying a load of 40 kilos on the head reduces stability by 30 per cent and carrying the same load against the chest reduces stability by 8 per cent. In the case of women, particularly those wearing high heeled shoes, stability is reduced in all the circumstances studied.

The following table gives the friction coefficient at 0.3 cm/s for different combinations of flooring and shoes (Harrison and Malkin, 1983). Depending on the shoes worn, certain kinds of floor covering should be avoided. However, the table shows above all the complex nature of the choice since some readings may be even slightly higher if the floor is damp and because rubber, although always preferable to leather, does not necessarily resolve all the problems, depending on the type of flooring chosen.

<table>
<thead>
<tr>
<th>Kind of floor</th>
<th>Friction coefficient</th>
<th>On dry floor</th>
<th>On wet floor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rubber soles</td>
<td>Leather soles</td>
</tr>
<tr>
<td>Cement</td>
<td>0.86</td>
<td>0.62</td>
<td>0.76</td>
</tr>
<tr>
<td>FC2 vinyl</td>
<td>0.71</td>
<td>0.29</td>
<td>1.64</td>
</tr>
<tr>
<td>FC3 cork</td>
<td>0.56</td>
<td>0.31</td>
<td>1.11</td>
</tr>
<tr>
<td>Wood</td>
<td>0.54</td>
<td>0.34</td>
<td>1.36</td>
</tr>
<tr>
<td>PVC linoleum</td>
<td>above 3</td>
<td>0.45</td>
<td>0.78</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>1.20</td>
<td>0.46</td>
<td>0.93</td>
</tr>
</tbody>
</table>

The cleaning of floors in the food industries involves the use of solvents to remove grease, which as shown above make all kinds of floors slippery. It is interesting to note that dust is an almost equal source of danger as a greasy and muddy surface. A study of the friction coefficient also shows which product should be avoided to reduce the risk of slips and falls. For Harrison and Malkin these products are the following:

- products with very high alkalinity (pH greater than 10);
- products containing too many silicates (SiO₂);
- products containing polish or wax;
- products containing sulphate (SO₃);
- those leaving deposits in laboratory tests;

For floors which may be covered with water, improvements could be sought by making them rougher through appropriate shaping or the inclusion of silicon particles in the surface, for example.
In conclusion, the following personal protective equipment is recommended for use in the food industries:

- clean work clothes which are changed regularly and as often as necessary;
- caps and hair nets;
- non-slip boots for all staff;
- three-fingered or five-fingered mail gloves for work with knives;
- glass-fibre protective aprons which are lighter than those in metallic fibres and easily washable;
- nose and mouth masks in designated workplaces;
- ear-muffs in noisy workplaces.

The use of such personal protective equipment should not lead to a disregard for the need to design workplaces in accordance with ergonomic principles.

Visibility should be good so as to prevent slips and falls. The lack of light and insufficient contrast in lighting may prevent workers from accurately gauging distances and obstacles. But too much light and glare may also reduce perception. The presence of a staircase in a corridor may be dangerous if the corridor is not marked every now and then by some sign or decorative motif. Indeed, perception of distance in a corridor is related to binocular vision which depends upon the presence of points of convergence. It is therefore recommended that if a change must be made in the level of the floor, the corridor should perhaps be decorated to include some eye-catching images.

Attention must also be paid to the fact that fatigue may occur when a worker carries a heavy load from one place to another, thus increasing the risk of accident.

Treatement of the environment

Elimination of smells

It is important to disperse odours produced by industrial work for three reasons:

- to ensure staff comfort;
- to prevent the impregnation of clothing;
- to avoid complaints from those in the vicinity.

The food industries rank high in the list of malodourous industries: little difference separates abattoirs, canneries, dairies, cheese dairies, breweries, distilleries etc. Although it is true that workers in the food industries react very differently to the presence of smells, it is nevertheless true that unpleasant smells are a characteristic inconvenience of the industry which should be prevented.
The task is far from easy. Firstly, the olfactory stimulation mechanism is still poorly understood; secondly, the sense of smell is so fine that for some chemical substances even one part per one thousand million can be detected; thus the use of instruments to measure noxious levels is extremely unreliable. Properties of physiological adaptation are another characteristic of the sense of smell, although the degree varies considerably from one person to another.

Several methods are used to reduce or eliminate smells:

- ozonisation by special lamps; this technique is applied above all in the stocking of foodstuffs: in vessels transporting fish or other frozen merchandise, banana ships, warehouses for stocking fruit, etc.;
- elimination or dilution - by the circulation of air, ventilation combined with suction, trapping of smells at source;
- absorption by active carbon - used as a filter in processing animal waste, in canneries and cold chambers for fruit and cheese;
- thermal combustion (the burning of malodourous gases in a furnace) - used in the torrefaction of coffee and chicory;
- catalytic combustion (in the case of high concentrations, the malodourous air is passed through a catalytic burner) - used also in the torrefaction of coffee and chicory;
- dry absorption (grease filters made of wire-netting) or liquid absorption when products are emulsifiable or soluble (this technique is used for fish-based foodstuffs, waste from abattoirs and in the torrefaction of coffee);
- masking agents (agent superimposing its own smell on the malodourous smell) (but care should be taken that potentially toxic substances are not also disguised) - this technique is used in the stocking or processing of the by-products of abattoirs (grease), fisheries (fish meal), fruit and vegetable canning (residual water).

In each case the suppression of smells is a complicated and costly process; it is therefore important to deal with the problem during the actual design of buildings and workshops.

Noise

Although the treatment of noise in the food industries is not basically any different from that of any other industry, it is well known that bottling is one of the most noisy operations but one in which improvements can be made. Noise prevention should firstly be directed towards its sources and protective measures should be envisaged only as a last resort although they may be obligatory in some countries when the level of noise exceeds 90 db(A).

Heat

In the same way the prevention of environmental heat in the food industries presents no special characteristics; protection against radiant
heat is achieved by the use of screens, refrigeration of the air or by the use of protective clothing.

Cold

This subject is dealt with in Chapter IV, which mentions some methods of providing protection against cold in slaughtering, meat dressing and canning. In short, it can be said that workers should be allowed to limit their exposure to cold either by a modification of their tools or the use of gloves, by heated seats or the reduction of work time spent in a cold environment.

**Ergonomic conception and analysis of workloads:**
the search for a global method of prevention

Although the analysis of occupational accidents or diseases reveals the immediate source of the incident, the deeper causes may remain undetected because of the complex nature of working conditions and the working environment.

Thus in addition to the investigations into occupational accidents and diseases, recourse is also had to methods which rely upon the participation of all the persons involved in the work situation (including the workers themselves) and which reveal a complex "pathology" of the working environment. Two examples will illustrate this approach. The first concerns accident prevention in a works restaurant. 4

At the request of the management of this restaurant, ergonomists and representatives of the staff and management initially undertook a study of frequent accidents. These accidents proved to be typical of accidents in the food industries: falls and bruises were the most frequent, followed by burns and miscellaneous injuries. These various accidents are related firstly to the state of the floor (greasy, covered with waste products), the installations themselves (splashing of oil) and equipment used by the staff (carrying of too heavy loads) as well as to work organisation (too frequent movements over unduly long distances). The occupational physician noted dorsal and dorso-lumbar pains, circulatory disorders of the lower limbs as well as the after-effects of previous injuries. The study showed an excessively high level of absenteeism (11.4 per cent) and the constant employment of replacement staff. Job transfers were also very frequent and due to specific complaints: overwork, fatigue, restrictive work schedules. Mention was also made of incidents which in themselves were not serious but were early warning signs of an accident. A number of critical incidents were pointed out by the staff: upset trays, cluttered floor surfaces, difficulty of relations between the different categories of staff. At a second stage, once all this information had been collected and the above-mentioned hypotheses proposed, a real analysis of work was carried out with specific reference to the work methods actually used by the staff. This analysis showed that in addition to the physical load, the staff was also subject to an important mental strain (in this case the immediate memorisation and transmission of a large amount of information). In fact it was this part of the work which gave rise to the communication problems between the members of staff. Finally, excessive heat and noise in the physical environment were also measured.
After establishing the necessary relationships between all these observations, the ergonomists were in a position to propose solutions concerning the organisation of job content, the quality of equipment, the reorganisation of premises, with care being taken not to affect the nature of the work itself or the relationship between staff and customers. After changes were introduced with the agreement of the staff and management, the final phase of the study consisted of a confirmation of the validity of the changes which had been introduced. It was possible to make use of a quantitative indicator: on the one hand, the number of accidents which dropped significantly, and even down to zero and, on the other, the amount of contributions paid for the purposes of insurance, which also dropped considerably. This study is exemplary in that it was entirely carried out by the multi-disciplinary group and was verifiable.

The second example is an ergonomic study in the bottling department of a brewery, presented in the form of a draft code of conduct.\(^5\) The problem involved designing and introducing bottling groups with a view to improving three aspects of working conditions: the physical environment, job content and job enrichment.

The first stage consisted of an analysis of typical bottling work. The main factors considered were noise, humid heat and unexpected incidents requiring a rapid reaction by operatives and imposing a considerable degree of restriction, the frustration of machine operators who can only deal with the consequences of mechanical breakdowns, the dependence of bottling on maintenance and finally the improved positioning of control posts as part of a supervision strategy. On the basis of this diagnosis of the causal relationship between these different problems, the code establishes preventive action objectives bearing on the improvement of the environment; the positioning of workplaces in such a way as to allow operators to communicate and help one another in the event of incidents and to improve supervision strategies; and job enrichment by entrusting operators with certain maintenance tasks. After implementation, the preventive action was tested by the use of various criteria: length of stoppages, breakdowns, complaints.

The role of prevention in the food and drink industries

The efforts recently made by France in this sphere may be viewed as a harbinger in this connection. By establishing working groups for the agro-food sectors, the Ministry of Industry and the Secretariat of State for Research gave specialists and representatives of these different sectors the opportunity to plan for the future on the basis of present-day realities.

The comments of the meat sector, which are particularly interesting, have been published.\(^6\) The most original idea put forward by the group is that fresh thought should be increasingly given to the whole range of operations and organisation which "take the animal to the consumer's plate". To reorganise these operations means reconsidering the transportation of animals, their stalling in abattoirs, the stress which they may undergo as a result of poor conditions and the consequences of these various factors on the quality of the meat. It also means re-examining the work processes before slaughtering to protect staff from the risks posed by the handling of live animals and to reduce the risks of subsequent contamination. It requires a new approach to slaughtering itself and the boning and sorting operations. The so-called "dirty" sections are not always separated from the "clean" sections. In this connection it was recommended that the risks of
contamination should be monitored throughout the entire period of these operations, a task which could be entrusted to a hygienist using relatively simple methods. It is obvious that in such a case, the conveyor would have to be redesigned, which would improve the slaughtering work and the medical supervision and health of workers, in particular by the constant inspection of tools and installations to detect contamination. It should be noted that the French experts believed that contamination by germs present in the air has not been conclusively proved. It is however preferable to ensure the proper ventilation of the conveyors so that operators can work at a comfortable temperature. The report also mentions that the hanging up of carcasses during boning would be preferable from the health point of view although once again this has not been proved. Today the practice of hanging up animals (even live ones in the case of poultry) is becoming very widespread in slaughtering. These conveyors which are in constant movement have a number of disadvantages from the ergonomic and safety point of view in that they increase the pace of work and above all standardise working times. Finally the experts' report mentions that the meat industry is a very large consumer of energy, in particular for refrigeration, and asks whether it might be possible to reintroduce more traditional methods such as drying, salting and smoke curing. The availability of a variety of preservation methods should be an opportunity to review the nature and selection of work methods not only from the point of view of productivity and profitability but also from that of safety and comfort.

Thus the meat sector illustrates an approach which could be extended to all other production sectors in the food industry where the same product quality criteria should be applied to all produce:

- hygiene criteria (contamination before and during packaging, applicable to all foodstuffs);
- preservation criteria;
- aesthetic criteria: appearance of the product and its packing;
- taste criteria;
- economic and market criteria.

Technological developments in the food industry should moreover be judged in the light of the safety and health of workers. It has been noted in particular that some processes may lead to a new occupational pathology as in the case of packaging, which nevertheless is particularly attractive to customers. Without totally abandoning the use of packaging, producers should carefully consider the material to be used, especially since the abuse of packaging has consequences on the environment and the quality of the air we breathe.

Problems arising in developing countries and in small and medium-sized undertakings

In developing countries a number of occupational health and safety problems are common to all branches of economic activity although there are some which may be peculiar to the food products and drink industries.
In large undertakings, the general status of workers is relatively satisfactory although in many activities temporary wage earners are still recruited without any social or medical protection. Vocational training efforts are being made but questions of occupational safety and health are only rarely mentioned.

The importing of technology is limited by financial constraints and inadequate national technical skills. The modern technologies adopted give rise to new social relationships and needs which disrupt habits and customs. This failure to adapt to the socio-cultural framework and the resulting constraints will lead to disruption and physical disorders (reduced resistance to common diseases, fatigue and premature ageing, absenteeism), psychological problems (nervous and emotional tension, neuroses and other symptoms of failure to adapt) and social malaise (uprooting, alcoholism, destruction of the family structure). Interesting attempts are being made in some developing countries to use better adapted technologies although they are still not well known.

In large undertakings the standards regarding the safety and hygiene of workplaces appear to be satisfactory. Sometimes there is a service responsible for occupational safety and/or an occupational safety and health committee as required by law but which is insufficiently active. Guarding of machinery is generally mandatory although the supervision of the working and physical environment is still inadequate.

At workplaces there is often a failure to respect safety and health regulations and some resistance to the wearing of personal protective clothing, when available. Because of the shortage on the national market, it is difficult to satisfy the often expressed need for personal protective clothing.

There is frequently a works medical service although its functions are limited to providing care for workers and their families. The physician is too busy with his task of providing curative medicine to devote time to the supervision of risks at workplaces; moreover his training does not prepare him for the prevention of hazards faced by workers in the actual work situation. Pre-employment and periodical medical examinations, when carried out, do not establish a relationship between the fitness of the worker and the requirements and hazards of a workplace.

In conclusion, the occupational health and safety conditions are relatively satisfactory more as a result of a respect of legislative texts than through any awareness of the problems by the social partners. However, a basis for development does exist which requires more decisive involvement by employers' and workers' organisations in informing and educating workers and ensuring a more effective supervision of workplaces and workers' health.

Small and medium-sized undertakings are precarious establishments with low financial capacity but whose economic role is being increasingly recognised by the public authorities. A high percentage of labour is provided by temporary workers. This precarious status means that workers - the large majority of whom are women - more easily accept the least skilled and most unpleasant jobs.

The means and methods of work are often archaic. It is carried out in poor conditions, lacking the minimum facilities (drinking water, hygiene, sanitary installations, rest rooms etc.). The rudimentary tools and techniques used require considerable physical energy and time to achieve low productivity.
The persistence of dangerous and unhealthy practices accepted by the inexperienced employer exposes workers who are undemanding and solely concerned with their wage to permanent risks which may endanger their health and sometimes their lives; poor hygiene, inadequate premises, a noxious physical environment, unguarded and poorly maintained machinery.

The supervisory staff are rarely aware of the economic importance of better occupational safety and health conditions. The workers, who are of rural origin and therefore have no industrial tradition, accept these conditions as inevitable. Their essential objective is to have a job and a wage. The level of trade union membership is very low. Many of these small and medium sized undertakings lie outside the control of legislation or regulations.

The role of employers, workers and governments

In the food and drink industries as well as in other branches of economic activity, attempts are increasingly being made to make employers, workers and their organisations aware of the importance of occupational safety and health. Nevertheless there is still room for more sustained action in this field, especially in the developing countries and in small and medium-sized undertakings.

In most countries, it is the employer's responsibility to establish and maintain a working environment which is as far as possible free from risks to the life and limb of the workers. The legislation of a number of countries confirms this responsibility whereby the undertaking is obliged to take the necessary measures to guarantee, during its operations, the highest levels of occupational safety and health. It is also the responsibility of the undertaking to inform workers of the hazards which exist in workplaces and of ways of guarding against them. Furthermore the undertaking is obliged to devote considerable attention to the training of its staff - both managerial and workers. This training must be ongoing.

National legislation establishes the minimum level of protection which the undertaking must respect, in collaboration as far as possible with the workers.

In order to fully accomplish its responsibilities in the field of occupational safety and health, the undertaking must establish and implement a clearly defined policy. It will no doubt be useful if workers can take part in determining this policy. Their participation in the establishment of conditions likely to eliminate or attenuate as far as possible the hazards in the working environment will thus be more active.

Measures should therefore be taken to ensure the participation of workers in the training activities provided for staff; information on occupational hazards should involve a two-way process: the employer should inform workers of the existence of hazards and the means of prevention and the worker should immediately inform the employer of situations which are likely to lead to an accident or disease.

The joint safety and health committees which have been set up in undertakings provide a very useful exchange of information between the representatives of workers and employers. The results of the action of these committees in the food and drink industries have been recognised as being
very positive in several countries. The committees also play a major role in training staff. In some countries they also facilitate the work of labour inspection. The investigation of accidents by these committees will very often be the basis for preventive measures proposed to the management of the undertaking. Furthermore, the committee will be in a position to supervise the proper application of the measures recommended by its members.

Another method of joint action between employers and workers is collective bargaining. In bargaining between employers and workers in the food and drink industries the questions of working conditions, occupational safety and health have sometimes been added to other items under discussion. It is above all as a result of the training given to workers on these matters that it has been possible, in certain situations, to meet the workers' demands regarding the prevention of occupational accidents and diseases.

The role of the government is not only to draw up laws and regulations but also to determine general policies for the gradual improvement of working conditions and the working environment, the proper functioning of the labour inspectorate, training and research services as well as the co-ordination of the activities of the various official bodies and employers' and workers' organisations.

In the food and drink industries of some countries two tendencies occur in the practice of labour inspection: in the one, inspection is more a matter of guidance than of control; in the other, there is the practice of trade union inspection, with the direct intervention of workers and their representatives in the labour inspection system in general and in the improvement of working conditions and the working environment in particular. Consultation between the various bodies responsible for inspection would therefore be desirable.

The Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164), of 1981, contain very useful pointers as to the role of governments, employers, and workers and their organisations, and may constitute a valuable guide for the establishment of policies to be implemented both at the national level and at the level of the undertaking by means of tripartite action for the improvement of working conditions and the working environment in the food and drink industries.

Notes


CHAPTER VI

MEDICAL SUPERVISION AND PERSONAL HYGIENE

The occupational health services

The Occupational Safety and Health Convention, 1981 (No. 155), and Recommendation, 1981 (No. 164), contain provisions concerning action to be carried out at the level of the undertaking. Of the measures which may be included within such action, Recommendation No. 164 refers to the need to take, having regard to the size of the undertaking and the nature of its activities, organisational measures concerning the safety and health of workers and the working environment. It adds that "as necessary in regard to the activities of the undertaking and practicable in regard to size, provision should be made for: (a) the availability of an occupational health service and a safety service, within the undertaking, jointly with other undertakings, or under arrangements with an outside body; (b) recourse to specialists to advise on particular occupational safety or health problems or supervise the application of measures to meet them".

Until now the organisation of occupational health services was regulated by the Occupational Health Services Recommendation, 1959 (No. 112), which strongly influenced national legislations. Progress achieved in the use of methods to evaluate the working environment and its effects on the health of workers increasingly points to the need for a multi-disciplinary approach to these services by a team of specialists and technicians. National policies which have been adopted in the sphere of occupational safety and health and the growing importance of workers' participation, as well as the advent in a number of countries of a health strategy covering everyone, fully justify the re-examination at the international level of the role of the occupational health services and of their contribution to the improvement of workers' health.

The subject of occupational health services was therefore included, for a first discussion, on the agenda of the 70th (1984) Session of the International Labour Conference. A report on the subject was prepared by the Office in 1983 which reviewed the organisation of these services in different countries. According to the report, the action of occupational health services should remain essentially preventive. Their function should in particular be: the supervision of workers' health; the supervision of the working environment; the increased adaptation of work to man; education, information and advice on occupational safety and health and ergonomics; and the administration of first aid and emergency treatment.

The report insists on the need for the occupational health services to draw up a programme of activities adapted to the undertaking or undertakings they serve, with account being taken both of the occupational risks characteristic of the working environment and of the particular problems of the branch of activity in question. Such a formula is particularly appropriate to the food and drink industries where the inherent risks may vary considerably as a result of the large number of technical processes involved.

The medical supervision of staff in the food and drink industries involves a number of specific characteristics, for example as regards the prevention of food poisoning. The works physician plays a double role: on the one hand, as the physician responsible for supervising the staff of the
works restaurant or canteen, he can help to prevent food poisoning amongst staff in the undertaking and, on the other, by supervising the latter, he can help to reduce the risks of food poisoning on the consumer side.

The prevention of food poisoning

Contamination of foodstuffs may occur in several ways:

- during production: for example a cow may contaminate milk during milking if it has infected lesions on its udders;

- contamination caused by workers who are carriers of germs, which is by far the most frequent form; transmission may occur at all stages in the preparation of products, especially since manual operations are numerous;

- other vectors: insects, rodents, domestic animals;

- finally, contamination may occur as a result of contact with badly cleaned instruments, wooden work surfaces - which have been described as "germ nests" - cleaning cloths, dirty aprons.

Workplaces in the food industries should be designed differently from other workplaces. Toilets should never open directly on to places in which food is prepared and transported. The choice of material and machines is equally important: cleaning should be straightforward and all parts that come into contact with products should be easy to reach. Time must also be given to cleaning work and to the choice and cleaning of all linen used on the preparation conveyors.

The works physician should inform workers of the elementary principles of personal and occupational hygiene which are necessary for the prevention of food poisoning: washing hands, particularly after using the lavatory or blowing one's nose, refraining from spitting in work premises, wearing work clothes which should be placed in separate cupboards from personal clothing etc.

The World Health Organisation in its report on the state of health of food handlers, as well as in several other publications, examines this subject in some depth.

The carriers of human germs are the usual source of staphylococcus aureus, salmonella typhi and salmonella paratyphi present in foodstuffs; the transmission of tuberculosis from one person to another through food is unlikely. Foodstuffs may also transmit viral hepatitis, cholera and dysentery.

Persons suffering from an acute gastro-intestinal disorder, an infection of the skin or upper respiratory passages should not be authorised to work in places where they might contaminate foodstuffs. Thus clinical examination is significant only for persons showing symptoms, in particular in the case of skin infection; in this connection the WHO report accords special importance to the works nurse.

As regards research on germ carriers, experts' opinions differ and may even disagree with national regulations.
The bacteriological examination of stools for example is far from being as effective as some people think. If such an examination reveals the presence of germs, it may be concluded that there is infection but if this is not the case, it is not possible to exclude the presence of an infection since the contamination of stools is neither permanent nor distributed in a homogeneous manner.

The following recommendations may be made concerning the preparation of foodstuffs in general:

- pre-employment and periodical medical examinations should include a systematic search for parasites in stools;
- chronic carriers of salmonella and shigellae should be treated and separated from temporary carriers;
- the systematic search for pathogenic streptococcae and staphylococcae should be discontinued but staff should be asked to inform the works physician (if there is one) of any oto-rhino-pharyngeal, digestive or skin infections from which they may be suffering;
- the works physician should be allowed to carry out all the bacteriological examinations which he deems necessary, in particular on a worker's return from sick leave;
- staff should be provided with all the facilities required by hygiene, and in particular as regards the hands;
- health education should be given to the staff.

Some of these tasks are the responsibility of the medical service but it is up to the undertaking to ensure that the health installations comply with these recommendations and that they are maintained correctly. It seems preferable to spend money on buying soap and installing proper lavatories rather than on laboratory research.

**Occupational hygiene, labour inspection and organisation of work**

It is the responsibility of the meat inspector to check the cleanliness of instruments and equipment coming into contact with meat. Frequent washing of hands is necessary as well as that of aprons. Knives should be steam cleaned, but afterwards they are too hot to be handled. Instruments should be placed in boxes without a metal or plastic bottom since the traditional containers tarnish very quickly. Plastic aprons are preferable to fabric ones. All this naturally requires considerable attention.

However productivity demands also play a part. The faster a worker is expected to work, the more hygiene is neglected. For example, sufficient time is required to remove the anus properly so that the animal's gall bladder can be extracted after slaughter without being perforated.

Gloves to protect workers against cuts pose further hygiene problems. The operator should be able to clean all his instruments when moving from one animal carcass to another so as to ensure that if the first is contaminated, the infection is not passed on to the next animal.
It is obvious that the pace of work should allow for the proper application of hygiene measures and standards should be established to this end. In some countries the number of carcasses which can be examined in one hour by the meat inspector is fixed; it may be asked why a similar restriction does not also apply to operators.

The time limit will, of course, depend on a number of factors: the extent to which the work process is mechanised, the number of workers assigned to the job, etc.

The respect of this time limit will necessitate an improvement in work organisation which may in the end prove beneficial for the safety of operators and their working conditions.

Similarly, the conveyor should be installed in such a way that the inspector can move easily from one work station to another and thus carry out his work without difficulty. This requirement while aimed at hygiene and customer satisfaction, may also favourably affect the design of slaughterhouse conveyors.

**Hand washing**

The frequent washing of hands is a personal hygiene measure which reflects the concern of producers to avoid contaminating foodstuffs, particularly meat. It is equally useful as noted above for the prevention of occupational dermatoses which are encouraged by cutaneous dirt. But the wrong kind of washing soap may itself encourage and even produce lesions.

Certain micro-organisms found on the hands belong to the so-called transitory flora which are deposited on the skin when the hand comes into contact with a contaminated object or product; for example a dirty knife. The number of permanent flora micro-organisms normally present on the skin remains practically unchanged, as does their nature.

Hands can be washed in two different ways: thorough washing, the purpose of which is to reduce the permanent flora in a lasting manner so that no undesirable micro-organism can embed itself in the hand or multiply there. This form of washing protects the worker himself. "Hygienic" washing is intended to prevent undesirable transitory flora micro-organisms from being transmitted by the hands or contaminating the environment during washing. The micro-organisms must therefore be rendered harmless on the hand itself.

How should hygienic washing be carried out? In theory, it can be done with soap and water but soap, whether in liquid or solid form, can be contaminated. Use must therefore be made only of liquid soaps or emulsions containing a bacteriostatic agent.

The problem, found both in hospitals and in the preparation of foodstuffs, stems from the fact that contacts with soiled objects occur repeatedly, thus necessitating frequent washing. However the skin should not become too dry. Protective substances might therefore be added to soap.

Apart from the right soap, workers in the food industries require enough time to wash their hands (30 seconds for hygienic washing and two minutes for thorough washing before and after work). Moreover, attention should be paid to the instructions given by the soap manufacturer.
The employer should provide his staff with proper hand-washing facilities including a wash-bowl, a liquid soap dispenser, a hand-towel dispenser and a waste bin. Towels should be of high-quality paper so as to avoid all forms of minor skin injuries (it will be recalled that in the meat sector in particular, workers' hands are often chapped through contact with objects, tools etc.) because micro-lesions encourage germs.

Notes


SUMMARY

This report takes stock of the present situation as regards occupational health and safety in the food and drink industries.

It refers to the decline of certain occupational diseases and to the appearance of new ailments which do not as yet figure on the list of diseases qualifying for compensation in most countries but which are described as work-related rather than occupational diseases.

The decline of some occupational diseases may be attributable to improvements in "upstream" operations of the food industry. By contrast, certain substances with which vegetable produce is treated during growth may be harmful to workers engaged in vegetable canning and packaging operations.

The protection of agricultural and industrial workers under the same system is conducive to good relations between agriculture and the food industry. Food industry enterprises readily set up plants in rural areas and in that way attract employees from among the farming population or, possibly, workers in the primary sector who are exposed to the same hazards inside and outside the plant. Hence, it is desirable that agricultural workers and workers in the food industries should receive similar training.

Some ailments specific to the food and drink industries are traceable largely to changes in technology. Those using industrial equipment should obtain the necessary advice in order to avoid buying material or equipment that adds to the hazards in the plants.

Accidents are still very frequent and serious in the food and drink industries, and the nature of the accidents hardly changes, if at all, with the passage of the years. However, there has been a change in the analytical approach to the causes of these accidents and in efforts to devise precautionary measures. For example, in the light of inquiries into the problems of accidental falls, recommendations have been made concerning types of shoesoles and concerning products used for removing grease from the shop-floor.

The report discusses the problems of lighting, temperature and noise in the food and drink industries.

It is a distinctive feature of the food industry that the demands of the product have implications for the health and safety of the personnel. Accordingly, it is possible to visualise a system of relationships between the persons or services concerned with the quality of the product and the persons or services concerned with the workers' health and safety.

From this point of view, consideration should be given to the functions of the veterinary and of the health expert, in the case of the meat and dairy industries. The health expert and the inspector should be qualified to give their opinion on the installations (slaughtering with the carcass hung up or lying flat), the choice of tools, the cleaning and maintenance of the machinery, floor maintenance, etc.

It might be a solution to enlist the services of an ergonomist health expert to ensure the protection of the product and of the workers. This expert would act either by himself or, so far as possible, together with the works physicians, nurses and the safety officer, or even as a member of the safety team.
It has been shown that the workers' participation is essential if the health and safety measures taken by the enterprise are to be truly effective. The workers' participation is all the more important in the food and drink industries as the problem of personal hygiene arises constantly. It is indispensable that the workers should receive training in occupational safety and health.
SUGGESTED POINTS FOR DISCUSSION

The following points are suggested for the Committee's discussion. The Committee is, of course, free to change the order or formulation of the points or to add others, if it should so wish.

1. Need for statistical data allowing for in-country or inter-country comparisons concerning occupational diseases and industrial injuries in the food and drink industries; use of the data for the purpose of drawing up programmes of prevention.

2. Account to be taken of the links between workers in the agricultural and cattle-farming sector and workers in the food and drink industries, for the purposes of health protection.

3. Measures to be taken by the enterprises to ensure that the producers or manufacturers of equipment, machinery and installations respect safety and health standards; establishment of contact with the producers of foodstuffs and with cattle farmers to ensure that very strict standards of hygiene are observed up to the point at which the products reach the preparation and packing plants.

4. Measures for ensuring constant supervision of occupational safety and health by a health-safety-ergonomics team serving either one or several undertakings, with the active participation of the health inspectors and of the services responsible for the quality of the product.

5. Enlisting the participation of the workers in decisions to take action for preventing occupational diseases and industrial injuries; training in personal hygiene as part of training in occupational safety and health.

6. Promotion of research into measures for safeguarding the health of workers in the food and drink industries. Encouraging the public services, the enterprises and the workers to co-operate in using the results of the research for the benefit of the protection of the workers' health.