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OCCUPATIONAL HEALTH SITUATION  
IN LEBANON

29 September - 7 November 1968

by

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## I INTRODUCTION

This report is based on forty days' assignment, from 29 September till 7 November 1968, the purpose of which was the following:

1. To review the situation regarding the occupational health services in Lebanon and make recommendations for their further development, specifying the role of the Ministry of Health.
2. To prepare, if required, a draft plan of operation for the project and post descriptions for the WHO staff to be assigned to the project.
3. To prepare the list of equipment and supplies required for the project.

The history of this project dates back to 1957. The interest of the Government in developing occupational health services with the assistance of WHO was shown in the same year. A WHO consultant, Dr Arne Bruusgaard, was assigned to Lebanon for two months to study the occupational health problems. Then, in the academic year 1965-1966, a physician was granted a WHO fellowship to study public health and occupational health in Montreal, Canada.

In 1968, the Lebanese Ministry of Health requested WHO to provide an expert in occupational health to make a review of the actual occupational health situation.

A programme for the writer's visits and contacts was kindly prepared by Dr H. Jalloul, Director of Preventive Health Services, and Miss J. Abdel Messih, Chief, Section of International Health Relations in the Ministry of Health. The Director-General, Dr J. Anouti, was kind enough to assign Engineer Abdallah Baltagi as the writer's counterpart. Mr Baltagi was of great help and assistance. Through his co-operation, officials and non-officials concerned with the field of occupational health were contacted, and different sources of information were secured. Visits were paid to a number of health establishments, to officials and non-officials and to directors of different factories and training institutions.

In reviewing the activities related to the health protection of the gainfully employed persons, the following were considered:

1. The organization of health programmes in the Ministry of Health.
2. Programmes related to occupational health in the Ministry of Labour and Social Affairs.

3. The industrial development of the country through visiting one factory from each type of industry to have a good cross section of the industries of the country, e.g. spinning, weaving, dyeing, tobacco, iron and steel mills, ordinary and portland cement. New as well as old plants were visited, they were of different standards ranged in size between large, intermediate and small.

## II LIMITATION

It was difficult to obtain detailed informations to check and comment on the data provided, due to the short duration of the visit. However, it is felt that the information obtained permits to make an appraisal of the present situation of occupational health in Lebanon. It also permits to assess the potential of the existing facilities and the potentialities to develop an occupational health programme in Lebanon.

## III BACKGROUND INFORMATION

Background information was collected from the following reports and sources:

- Reports of Engineer Abdallah Baltagi
- Dr A. Bruusgaard
- Ministry of Health
- Ministry of Labour and Social Affairs
- Ministry of Economics
- Ministry of Planning
- Social Security Organization
- Different Universities
- Various other sources<sup>1</sup>

### 1. Geography

Lebanon is situated on the eastern shores of the Mediterranean Sea. Its area is about 10 200 sq. km divided into five provinces as follows:

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<sup>1</sup>See Annex III (References)

North Lebanon	2 025 sq. km
South Lebanon	2 020 sq. km
Mount Lebanon	1 891 sq. km
Bekaa	4 245 sq. km
Beirut (capital)	19 sq. km

Except for Beirut, the capital city which is considered a province in itself, the other four provinces are divided into counties (kada) as follows:

North Lebanon	(6 kada)
South Lebanon	(7 kada)
Mount Lebanon	(6 kada)
Bekaa	(5 kada)

In Lebanon there are 1 787 towns and villages plus 642 small agglomerations depending on nearby villages, making a total of 2 429 communities.

## 2. Demography

According to the records of inhabitants' registry, made in 1965 by the general directorate of vital statistics, the total number of population in Lebanon is estimated to be 2 367 000.

In addition to the Lebanese inhabitants, there is a total of about 500 000 foreigners residing in Lebanon, out of which 200 000 are refugees.

According to the Biostatistics Department in the Ministry of Health, the distribution of the population by age group in 1966 was estimated to be:

<u>Age Group</u>	<u>Percentage</u>
0 - 4	14.3
5 - 14	24.6
15 - 24	19.3
25 - 44	21.7
45 and over	20.1

### 3. Industrialization and Industrial Labour Force

The main industries of Lebanon are: food processing, production of soft drinks, textile, cement, furniture, metal works, iron and steel mill for production of bars, tanning, oil refineries, sugar refinery plant, olive oil pressing, tobacco, chemicals and plastics.

The total number of gainfully employed is estimated to be 700 000.

It was not possible to obtain up-to-date information and statistics on industrial development in Lebanon. A survey undertaken by the Ministry of National Economy in 1964 shows the following:

<u>Average No. of Workers</u>	<u>No. of Establishments</u>	<u>No. of Workers</u>
5 - 9	1 078	5 297
10 - 24	693	8 571
25 - 49	187	6 171
50 and over	<u>141</u>	<u>21 054</u>
Total	<u>2 099</u>	<u>41 093</u>

Among the 41 093 workers working in the establishments, 33 782 are men and 7 311 women. The same survey shows that 1 145 of the above mentioned establishments are owned by individuals, i.e. the factory is owned by one person.

Other data obtained from the Ministry of Economy relating to the number of establishments, considering also working places employing less than five workers, shows that the number of establishments in 1966 was 6 311 employing 63 239 workers. The total amount of money invested in industry during the same year was LL 988 206 000 or approximately US \$ 330 000 000.

### 4. Labour and Social Laws and Regulations

There seems to have been much improvement in formulating laws and regulations for the protection of the workers after the visit of the previous WHO consultant to the country.

The following are the most important laws and regulations concerning workers and their protection:

- i. Labour law of 23 September 1946 deals with employment, child labour, woman labour, working hours, wages, discharges and prevention of hazards, (article 61-65), labour disputes and unions' affairs.
- ii. Decree 24 ET of 4 May 1943 deals with work accidents, medical treatment and reporting of accidents, courts dealing with work accidents and also their registration.
- iii. Decree 6 341 of 20 October 1951 pertains to undertaking appropriate measures for the health protection of the workers and the prevention of accidents.
- iv. Decree 8 377 of December 1961 in which the organizational aspects of the Ministry of Health are described. Article 34 mentions that there should be a section for occupational diseases and accidents organized under the direction of the Preventive Health Services.
- v. Decree 8 353 of December 1961 in which the organizational aspects of the Ministry of Labour and Social Affairs are described. In its article 15, it mentions that there should be established a department, the functions of which would be to inspect and ensure the safety and security of the labourers. This department should be headed by a director assisted by five labour inspectors and one physician acting as medical inspector. Article 15 mentions also that the number of labour inspectors in all provinces should be thirty-seven.
- vi. Code of social security of 26 September 1963 covers four topics: family allowances, discharge indemnities, disease and maternity care, and occupational diseases and accidents. The first two topics have been put into execution since 1965, and it is expected that the latter two will be put into action in the near future, probably between 1969 and 1970.

#### IV HEALTH FACILITIES AND MANPOWER

1. A report prepared by the Ministry of Planning in June 1965 indicated the health establishments as in the following table:

Province	Private Hospitals		Governmental Hospitals		Total		Percentage	
	No. of Hos-pitals	No. of Beds	No. of Hos-pitals	No. of Beds	No. of Hos-pitals	No. of Beds	Hos-pitals	Beds
Beirut	57	2 302	2	247	59	2 549	43	32
Mount Lebanon	23	3 171	5	268	28	3 439	20	45
North Lebanon	27	682	4	277	31	959	23	13
Bekaa	1	107	2	148	3	255	2	3
South Lebanon	12	294	5	266	17	560	12	7
Total	120	6 556	18	1 206	138	7 762	100	100

According to a statement given by the Department of Medical Care in the Ministry of Health, since 1965, there had been an increase in the number of governmental hospitals, as well as private hospitals since three new governmental hospitals with 250 beds were constructed and four private hospitals with 700 beds are under construction. Hence, the number of governmental hospitals is twenty-one with 1 456 beds, and the number of private hospitals is 124 with 8 462 beds. The total number of hospitals in Lebanon is 163 with 9 918 beds. Therefore, there are approximately 4.2 beds per 1 000 inhabitants.

The same report shows the distribution and number of dispensaries in 1965, in the following order:

Province	Number	Percentage
Beirut	42	20
Mount Lebanon	79	40
North Lebanon	33	16
South Lebanon	19	10
Bekaa	26	14
Total	199	100



The 199 existing dispensaries are operated as follows:

Group	No.
Governmental dispensaries	44
Municipal                   "	14
Private                     "	115
Joint                       "	26

Also, according to the statement given by officials in the Ministry of Health, an increase of eight private and two municipal dispensaries has been recorded since 1965. Hence the total number of dispensaries through all the country is 209.

2. According to statistics obtained from the Ministry of Health, the health manpower is estimated to be as follows:

Physicians	2 042
Dentists	460
Nurses	1 400
Midwives	460
Nurse aids	700
Pharmacists	526
Pharmacist aids	167
Veterinarians	30
Veterinarian aids	679
Sanitary Engineers	14
Sanitarians	24
Sanitarian aids	2
Laboratory technicians	100

Out of 2 042 physicians, 1 189 are general practitioners and the remaining 853 are specialists as follows:

Internal Medicine	297
Dermatology	25
Neuro-Psychiatry	28
Gynaecology and Obstetrics	93
Anaesthesia	20
Surgery	309
Laboratory Technology	20
Radiology	32
Physical Medicine	1
Legal Medicine	3
Public Health	28

The ratio of physician persons is  $\frac{2\ 042}{3\ 330\ 000}$ . In other words,

there is one physician for every 1 600 persons. This result is comparable with developed countries.

#### V SOME STATISTICAL DATA CONCERNING THE HEALTH SITUATION

A survey undertaken in 1966 by the School of Public Health in the American University of Beirut, for the city of Beirut, gave the following results:

- Crude Death Rate	6.9 per 1 000
- Infant Mortality Rate	14.1 per 1 000
- Birth Rate	24 per 1 000

These results are comparable to developed communities.

An excess of male over female deaths had been observed with 55.4 years as the mean age of death for males compared to 58.3 years for females.

Death from coronary heart diseases, accidents and suicides was significantly higher among males.

It was not possible to get representative information about rural areas at the present time. Only a survey made by the School of Public Health, American University of Beirut in 1953 in sixty-four villages showed an infant mortality of 244 per 1 000 of live births.

According to the Annual Report of Vital and Health Statistics for the year 1966, the birth and death rates in different provinces are estimated as follows:

Location	Birth rate per 1 000 persons	Death rate per 1 000 persons
Beirut	36.4	4.1
South Lebanon (Rural)	44.4	4.5
Mount Lebanon (Rural)	41.9	7.1
North Lebanon (Rural)	37.1	4.9
Bekaa	49.5	5.3

The crude death rate during 1966 is estimated for Lebanon to be 5.1 per 1 000 persons. This low rate in Lebanon may be due to incomplete registration, especially registration of infant deaths.

#### Prevalence of Communicable Diseases

The total number of communicable disease cases reported in Lebanon during 1966 were 996.

If comparison is made for the different diseases reported, they will be ranked in the following order:

Acute poliomyelitis	481 cases
Epidemic Cerebral meningitis	150 cases
Tuberculosis (all forms)	138 cases
Diphtheria	100 cases
Typhoid and paratyphoid	78 cases

#### VI OCCUPATIONAL DISEASES AND ACCIDENTS

In spite of the fact that reliable data were not available to the writer during his visits, he feels that Lebanon already has the entire spectrum of occupational diseases and hazards. According to a statement made by the supervisor of a factory, during a year's time, 100 workers out of 140 were sent to hospital as a result of accidents and diseases.

In a private hospital which, as a contractual hospital, serves the Ministry of Health, the specialist in charge of the emergency section mentioned that 30 per cent of those who call on the emergency section suffer from occupational accidents, 40 per cent from traffic accidents and 10 per cent have intoxication by insecticides some of whom swallowed it deliberately to commit suicide.

Generally speaking, the health problems of the gainfully employed in Lebanon include the general health problem of the adult population, to which have been added the health problems created by the adverse conditions of the working environment, namely occupational diseases and accidents, unsatisfactory man/machine relationship and undue physiological and psychological stresses of the individual.

## VII CONCEPTS OF OCCUPATIONAL HEALTH

### 1. Definition

Occupational Health is the branch of the medical and engineering sciences which is conceived with the study of the effect of the advisory environmental conditions in the places of employment upon the health of the workers, and the isolation of their health from the adverse conditions through the application of the principles of preventive medicine, curative medicine and sanitary engineering.

### 2. Aims and Objectives

There is only one basic objective and that is to protect and improve the health of employed persons, and the improved health of the workers can be expected to have a favourable effect on their production which could affect the national economy.

In the first meeting of the Joint ILO/WHO Committee on Occupational Health in 1950, as quoted in the second report World Health Organization Technical Report Series No. 66, 1953, the aims and objectives of occupational health were described as follows:

"Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of worker in an occupational environment adapted to his physiological and psychological equipment and, to summarize: the adaptation of work to man and of each man to his job".

Such objectives appear to envisage occupational health as dealing not only with the health problems related to work and working environment, but also with the total health of the gainfully employed. This interpretation is increasingly becoming accepted especially in developing countries like Lebanon. Because while it is true that in a number of developed countries, the health needs of the gainfully employed may be taken care of mainly by authorities or organizations outside the working place. The conditions in many developing countries, due to lack of health and medical resources, will force them to leave all, or most of the health problems of the worker to be organized and provided for through the place of employment.

The factors within an occupational environment which may have adverse effects on the health of workers could be physical, chemical, mechanical, biological, social, cultural, mental or emotional. All these factors are within the field of interest of occupational health physicians and industrial hygienists (engineers).

Hence, the team of occupational health deals with the employed person, his environment and the interaction and effects of these upon each other.

Because of the special conditions in developing countries the scope of the occupational health programme should include the following:

A. Inside the Plant

i. Medical Care

- For all accidents and diseases of occupational origin for which the working place is responsible.
- First aid, care of minor illnesses and acute intoxications on the job.

ii. Preventive Measures

- Pre-employment, periodic and special medical examinations, job analysis and evaluation.
- Control of all environmental factors, e.g. temperature, humidity, noise, light, vibration, radiation, electricity, gases, vapours, dusts, fumes, smokes, aerosols, safety etc.
- Immunization against communicable diseases.
- Health counselling (individual).
- Health education.

- Dental care.
- Mental health.
- Nutrition.
- Maintenance of records and reports.
- Human relations.

B. Outside the Plant

Industries usually contaminate the surrounding environment by their wastes and discharges which should be the concern of occupational health physicians and industrial hygienists. Therefore, outdoor air pollution, discharges of industrial wastes, safe transportation of workers to and from the working places, worker's housing etc. are problems created by industries in the solution of which the occupational health team participates.

C. Social Welfare

The occupational health physician must be concerned with the worker's welfare benefits, vacation and recreation, availability of medical care services to the workers and their dependents, health insurance schemes, etc. If solutions for these problems are neglected, unfavourable results are to be expected on the health of the worker and, consequently, would reflect on the worker's sickness absenteeism and his productive capacity.

It should be stated here that the occupational health physician has to pay substantial attention to the worker, while the industrial hygienist (engineer) is concerned with his environment. Without close correlation and co-operation between both parties, none of them can be effective and successful.

VIII OBSERVATIONS AND IMPRESSIONS

1. Although there is an occupational health section in the organizational chart of the Ministry of Health, as mentioned previously, this section is not yet in operation. Therefore, the occupational health programmes in the Ministry of Health did not start.
2. There is a Department of Labour Inspection and Health Protection in the Ministry of Labour and Social Affairs under the Division of Workers' Services. According to official statements in the Ministry of Labour and Social Affairs, there is a number of labour inspectors and labour inspector aids, distributed in the central province and other provinces as follows:

Location	No. of Labour Inspectors	No. of Inspector Aids
Beirut	5	5
North Lebanon	3	3
Mount Lebanon	3	3
South Lebanon	1	1
Bekaa	1	1
Total	13	13

In addition, there is also in that department a physician doing the work of a medical inspector for the factories and working places, and an engineer. Most of the labour inspectors are lawyers, and the inspector aids are secondary school graduates with a few months in-service training in labour inspection.

In 1965-1966 a course of six-month duration was carried out for the training and orientation of labour inspectors and aids. Almost half of the inspectors are performing administrative duties rather than factory inspection. Even those who are doing factory inspection are very much concerned with the foreign workers' affairs, check their licenses, working hours and shifts, and do not pay sufficient attention to the industrial safety and health protection. Checking on the environmental and working conditions in the places of employment is neglected, mostly due to the fact that the labour inspectors have no engineering and technical educational background for factory inspection. They are also not qualified for safety and industrial hygiene. Another fact is that, even if the labour inspectors were qualified, yet their number is not sufficient to check on all the establishments at reasonable intervals.

3. When visiting the factories, due to the limitation of time, the writer tried to visit one factory out of each group of similar type. Although it is mentioned in the labour laws that every factory having twenty workers or more, should have a physician available to the workers to help them solve their health problems, practically there are no such services available to the workers within the factories, except for a few large enterprises which have their own medical department within

the factory. In some factories, there is a part-time physician who reports only one hour a day, and sits in his office waiting for the workers to refer to him. He never gets into the factory to check on the environmental working conditions and to recommend improving those not conducive to the health of the workers.

Almost all the factories visited did not have satisfactory working conditions. Workers were exposed to excess heat in the metal work factories, to cotton dust in textile factories, to stone dust in cement factories and to many other hazardous environmental factors such as: noise, vibration, humidity, poor lighting, gases and fumes etc. House keeping and cleanliness of the industrial floors and walls were poor and insufficient. One could see floors, yards and corridors covered with all sorts of refuse, useless materials and remains of steel, wood and cardboard, etc. The floors were earthy and not covered with asphalt, tiles or such other things. Most of the industries depend on their own water supplies from deep wells and no drinking water is available in some of the factories. So, the workers have to bring their drinking water from home. There is no water fountain system available for the convenience of the workers.

Industrial waste waters are usually discharged into the sea without any treatment. The solid refuse is improperly disposed of; it is burnt somewhere around the factory or parts of it are sold to interested people. Only in one factory there was a sewage filtration system. There is a shortage of washing facilities such as lavatories and bath rooms and also of lockers in almost all the factories visited.

Exhaust systems were not satisfactory in most of the visited factories. Machines and equipment are installed without attention to safety rules. Personal protective equipment are different or improperly used. Health education programmes leave much to be desired.

4. Curricula of most of the training institutions related in a way to occupational health were reviewed. Every 3-4 years, an intensive course on occupational health for private physicians is given in the School of Medicine, Department of Preventive Medicine at the French University. The first course was given in 1960, and the second one in 1966. Twenty-five physicians attended this course, most of whom working on a part-time basis in different factories at a time. There is another course on industrial health given in the School of Public Health, American University of Beirut to students attending the B.Sc. in environmental health in their second year of attendance. This is a three-credit course with two hours lecture and three hours laboratory work per week. The Tripoli School of Sanitarians has already finished one year of its



two-year course. The Ministry is intending to insert in the second year's curricula, forty hours lecture and sixty hours practice in industrial health.

5. As already mentioned above, the social security scheme is under execution since 1953, but the only two topics which are covered by it are discharge indemnities and family allowances. Other topics like disease-maternity, occupational diseases and accidents are not yet covered.

## IX RECOMMENDATIONS

1. Dr M. Mohana was trained in public health in France during 1960-1961 with a diploma in public health, and in public health majoring in occupational health in Montreal during 1965-1966. He is for the time being working as a Kada health officer in Bint Jbeil. Dr Mohana could be transferred to Beirut to develop the medical aspects of the occupational health programmes.

2. Engineer Abdallah Baltagi, who has a good background, should be sent to the United Kingdom or to the United States in 1969 to study industrial hygiene for one year. Mr Baltagi is a sanitary engineer having his M.S. from the United States. He had some courses in industrial hygiene and he is a suitable person to accept responsibility for industrial hygiene in the Ministry of Health.

3. After Mr Baltagi's return, an occupational health physician and an industrial hygienist, possibly as WHO advisers, should be assigned to the project Lebanon 0025, each for two years, to assist the Government in setting up and developing occupational health services in the Ministry of Health. With their assistance, a service would be established to study the occupational health problems and to set up standards and regulations for the control of the industrial environment, and to carry out a preventive programme in the working places.

4. At least two rooms with a total space of sixty sq. m. should be made available in the central public health laboratory for the industrial hygiene laboratory. The biochemical tests relating to occupational health can be performed in the existing section of biochemistry in the central public health laboratory.

5. The basic instruments and equipment listed in Annex I of this report should be supplied by the Government, before the arrival of the advisers mentioned under paragraph 3 above.

6. The Section of Occupational Health in the Ministry of Health, appearing in the organizational chart under the directorate of Preventive Health Services, should for the time being be staffed at least with an occupational health physician, one sanitary engineer (preferably Engineer Abdallah Baltagi), and two laboratory technicians or sanitarians, and should gradually be developed.

7. The School of Public Health in the American University of Beirut, and the Department of Preventive Medicine in the School of Medicine in the French University, should strengthen teaching in occupational health. The following subjects could be emphasized in the curricula of undergraduate medical students and graduate physicians and nurses:

For Undergraduates

- a. Concepts and scope of occupational health
- b. Historical background
- c. Importance of labour laws and workmen compensation laws
- d. Role of the government in occupational health
- e. Relation of occupational health to general public health
- f. Common occupational diseases
- g. Basic principles of industrial hygiene and toxicology

For Graduates in Internal Medicine or Post-graduates in Public Health

- a. Principles of occupational medicine
- b. Industrial physiology
- c. Industrial hygiene
- d. Occupational pathology and toxicology
- e. Accidents at work
- f. Industrial technology
- g. Medico-legal problems and social security schemes
- h. Preventive measures in industry
- i. Organization and administration of occupational health services
- j. Occupational psychology

For the Nurses

- a. History of occupational medicine
- b. History of occupational nursing
- c. Labour-management relations
- d. Record keeping and analysis
- e. Environmental factors which effect the health of workers
- f. Principles of epidemiology and of screening in the factories
- g. Rehabilitation and selective placement
- h. Mental health
- i. Health education in the factories
- j. Treatment (first aid in industry - minor medical and surgical conditions etc.)

8. Labour inspectors are those non-medical personnel who are directly concerned for ensuring that the provisions of various labour laws, codes and regulations are observed.

Although there are two areas to be covered by the labour inspection, namely: technical, legal and administrative areas, at the present time, labour inspection at the Ministry of Labour and Social Affairs is mainly concerned with the latter area. The writer recommends strongly that the vacant posts in the labour inspection department should be filled with technically well-trained personnel, preferably mechanical engineers, graduates of secondary technical schools who are available in Lebanon. This recommendation is made because the labour inspection department in the Ministry of Labour and Social Affairs must not only cover the legal and administrative areas, but should employ trained and qualified persons with training in the following subjects:

- Factory design and construction
- Power sources
- Power transmission
- Machine design and guarding
- Unit processes
- Production techniques
- Principles of ventilation and heating

- Principles of lighting
- Principles of sanitation
- Principles of industrial hygiene
- Safety and accident prevention
- Personal protective equipment etc.

Hence, the labour inspector, provided with knowledge on the above mentioned subjects will, no doubt, be able to cover not only factories and mercantile establishments, but also constructions, mining, tunnelling etc.

9. In the field of workers' social welfare, the social security organization should be concerned with other most important subjects within its responsibility which are: disease-maternity and occupational diseases and accidents. They could benefit and learn from the experiences of the countries, which have already established such schemes, by sending officials to those countries to study successful schemes and procedures on the spot.

10. The medical department which is required in small, intermediate and large industries, should be established and equipped to cope with medical examinations and minor medical and surgical needs of workers, rather than sending them to outside clinics and hospitals in cases of simple injury or illness. Thus, better and positive occupational health services could be provided to the worker, and consequently, the proportion of work absenteeism will be greatly reduced, and further disabilities will be prevented, which will have a positive effect on the rate of industrial production.

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## ANNEX I

LIST OF BASIC INDUSTRIAL HYGIENE EQUIPMENT  
RECOMMENDED FOR SUPPLY

	Approximate Unit Price US \$	Quantity	Total Cost US \$
<u>Noise</u>			
Sound level meter with octave band analyser	1 000	1	1 000
Pocket sound level meter, Rion model	200	2	400
Audiometer portable	800	1	800
<u>Lighting</u>			
Light meter	100	3	300
Photometer cibata model 11 or equivalent	170	2	340
Luxmeter portable	50	2	100
Brightness meter	250	4	1 000
<u>Thermal Environment</u>			
Mercury barometer	60	2	120
Psychrometer (aspirating)	60	2	120
Psychrometer (whirling)	20	6	120
Glass kata thermometer	5	6	36
Silver kata thermometer	12	4	48
Globe thermometer	10	6	60
<u>Energy Expenditure Apparatus</u>			
Bag Douglas type 100 I	50	2	100
Gasmeter (Muller Franz)	120	2	240
Gas analysis Apparatus (scholander)	75	2	150

	Approximate Unit Price <u>US \$</u>	<u>Quantity</u>	Total Cost <u>US \$</u>
<u>Ventilation</u>			
Deflecting vane anemometer low/high range	300	1	300
Pitot tube	40	2	80
Thermo anemometer	220	1	220
Smoke tubes	25	10 Boxes	250
Inclined manometer	50	2	100
<u>Air Sampling</u>			
Face mask	15	2	30
Wet gasmeter	70	3	210
Dry gasmeter	25	4	100
Set of flow meters	150	1	150
Rotameter	30	6	180
Manometer	15	6	90
Pump portable, battery operated	80	4	320
Pump electrical	120	6	720
Set of standard midget impingers	150	2	300
Impinger with fritted glass	3	48	144
Air ejector	25	4	100
Stop watch	12	4	48
Hand pump (M.S.A.)	80	2	160
<u>Dust</u>			
Thermal precipitator	300	1	300
Electrostatic precipitator	500	1	500
Hechlet sampler	500	2	1 000
Conimeter	200	1	200

	Approximate Unit Price <u>US \$</u>	<u>Quantity</u>	Total Cost <u>US \$</u>
<u>Dust (cont'd.)</u>			
Drager hand pump with membrane filter holder	125	1	125
Membrane filters 50 mm (50 pieces in a box)	8	4 Boxes	32
Membrane filters 50 mm Constant weight (50 pieces in a box)	15	4 Boxes	60
High volume air sampler	200	2	400
Glass fiber filters	15	100	150
Microscope with eye-piece graticule for particle size measurement and stage micrometer	450	1	450
Projector microscope	400	1	400
Dust counting chamber	10	4	40
<u>Gases and Vapours</u>			
Drager multigas detector	60	3	180
Tubes for the above for the determination of:			
acetone	4 per .20	40	8
benzene	4 per .20	40	8
carbon monoxide	4 per .20	40	8
carbon tetrachloride	4 per .20	40	8
chlorine	4 per .20	40	8
formaldehyde	4 per .20	40	8
hydrocarbons	4 per .20	40	8
hydrocyanic acid	4 per .20	40	8
hydrogene sulfide	4 per .20	40	8
mercury vapour	4 per .20	40	8

	Approximate Unit Price <u>US \$</u>	<u>Quantity</u>	Total Cost <u>US \$</u>
<u>Gases and Vapours (cont'd.)</u>			
methylbromide	4 per .20	40	8
nitrous gas	4 per .20	40	8
sulfur dioxide	4 per .20	40	8
trichlorethylene	4 per .20	40	8
oxygen	4 per .20	40	8
Oxygen deficiency indicator	50	1	50
Explosimeter	120	2	240
Toxic gas paper test kit (DSIR method)	120	1	120
Accessories for the above	150	1	150
<u>Special Laboratory Equipment</u>			
Photo flurometer	1 200	1	1 200
Polarograph	1 500	1	<u>1 500</u>
			<u><u>15 653</u></u>



## ANNEX II

SUGGESTED BOOKS AND PERIODICALS FOR THE OCCUPATIONAL  
HEALTH DEPARTMENT LIBRARY

## ENGLISH

- Hunter, D. (1964)  
The diseases of occupations, the English Universities Press Ltd., London
- Jonston, R.T. and Miller, S.E. (1960)  
Occupational diseases and industrial medicine, W.B. Saunders Company
- Schwartz, L., Tulipan, L. and Birmingham, D.J. (1957)  
Occupational diseases of the skin, Lea and Febiger, Philadelphia
- Patty, A.F.  
Industrial hygiene and toxicology, vol. I (1959), vol. II (1963)  
(vol. III under preparation); Interscience publishers, New York and London
- Murry, R.  
Industrial health technology, Butterworth and Co., Ltd., London
- Fairhall, R.T. (1948)  
Industrial toxicology, Williams and Wilkins Co., Baltimore, Md., 2nd ed.
- Drinker, P. and Hatch, T. (1954)  
Industrial dust, McGraw, Hill Book, Co., New York
- Brandt, A.D. (1947)  
Industrial health engineering, John Willy and Sons, New York
- Barnes, J.M. (1953)  
Tonic hazards of certain pesticides to man, Wld. Hlth. Org. Monogr.  
Ser. 16, Geneva
- International Labour Organization (last edition)  
Model code of safety regulations for industrial establishments for the  
guidance of governments and industries, Geneva
- Sax, N.I. (1957)  
Dangerous properties of industrial materials, Reinhold Publishing  
Corporation, New York

ENGLISH (cont'd.)

American Industrial Hygiene Association  
Industrial noise manual, Detroit 27, Michigan

Clorig, A. (1958)  
Noise and your ear, New York and London

Illuminating Engineering Society,  
IES lighting handbook, New York

Industrial ventilation, a manual of recommended practice, American  
conference of governmental Industrial Hygienists

Heinrich, H.W. (1959)  
Industrial accident prevention, McGraw Hill Book Co., New York

Magill, P.L., Holden, F.R. and Ackly, C.H., (1956)  
Air pollution handbook, McGraw Hill Book Co., New York, Toronto, and  
London

Besseliere, E.B. (1952)  
Industrial waste treatment, McGraw Hill Book Co., New York, Toronto and  
London

Industrial Hygiene Foundation  
Industrial Health news literature abstracts. In: Industrial hygiene  
digest

American Medical Association  
A.M.A. Archive, env. Hlth, Chicago

British Medical Association  
Brit. J. Indust. Med., London

Industrial Medical Association,  
Journ. occup. Med., Baltimore

FRENCH

Simonin, C. (1956)  
Médecine du travail, 2em ed, Librairie Maloine, Paris, 1 vol., 1406 pp.

## FRENCH (cont'd.)

Derobert, L. (1954)

Intoxications et maladies professionnelles, mis à jour 1956,  
Editions médicales Flammarion, Paris, 1 vol., 1530 pp.

Gernez Rieux, C., Marchand, M., Mounier Kuhn, P., Policard, A. & Roche, L.  
(1961)

Brancho-Pneumopathies professionnelles, Masson et Cie, Paris, 1 vol.

Sadoul, P., and Dusapin, M. (1959)

L'expertise de la cilicase pulmonaire, Masson et Cie, Paris, 1 vol. 234 pp.

Marchand, M. (1949-1954)

Hygiène et sécurité du travail, Publication de la caisse régionale de  
sécurité sociale de Lille. Edition: Cronan et Roques, Lille, 4 vols.

Desoille, H. et al. (1959)

Cours de médecine du travail, Librairie le François, Paris, 3 vols.

Sartin, P. (1960)

La fatigue industrielle - Comment humaniser le travail, Editions SADEP,  
Paris 1 vol., 239 pp.

Bugard, P. (1960)

La fatigue - physiologie - psychologie et médecine sociale, Masson et  
Cie, Paris, 1 vol. 308 pp.

Arch. Mal. Prof., Masson et Cie, Paris

## ANNEX III

## R E F E R E N C E S

I Persons InterviewedA. Ministry of Health

Mr K. Junblatt	H.E. Minister of Health
Dr J. Anouti	H.E. Director-General of the Ministry of Health
Dr H. Jalloul	Director of Preventive Health Services
Dr J. Hatem	Director of Central Public Health Laboratory
Dr F. Maaluli	Director of Medical Care Health Laboratory
Dr E. Hayek	Director-General of inspection
Mr J. Andari	Chief, Dept. of Sanitary Engineering
Dr B. Fedawi	Chief, Dept. of Social Health
Dr M. Abou Shakra	Chief, Dept. of Preventive Medicine
Mr F. Khalifa	Personnel Officer
Mr A. Baltagi	Chief, Section of Planning
Miss J. Abdel Messih	Chief, Section of International Health Relations
Dr P. Fattal	Chief, Beirut Hospital
Dr T. A'war	Chief, Tuberculosis Centre
Mr G. Hakim	Chief, Section of Medical Profession
Dr F. Gorra	Chief, Laboratory in the Central Dispensary
Mr S. Massouh	Chief, Sanitary Engineering (Province of Mount Lebanon)
Dr R. Abdo Hanna	Chief, Section of Rabies Treatment
Dr H. Jesser	Provincial Health Officer of North Lebanon

A. Ministry of Health (cont'd.)

Mr B. Jahshani	Director, School of sanitarians (Tripoli)
Mr Z. Tarabulsi	Chief, Dept. of Biostatistics
Dr L. Tutunji	Provincial Health Officer of Mount Lebanon
Dr M. Mohana	County Health Officer of Bint Jbeil

B. Ministry of Labour and Social Affairs

Mr A. Farhat	H.E. Director-General of the Ministry of Labour and Social Affairs
Mr K. Senan	Chief, Dept. of Labour Inspection and Safety
Mr R. Khatib	Chief, Dept. of Labour Unions Affairs
Dr Kerkiashanian	Medical Labour Inspector

C. Social Security Organization

Dr R. Wahid	H.E. Director-General of Social Security Organization
Mr S. Rida	Chief, Public Relations
Dr A. Debs	Chief, Medical Officer
Mr M. Kowtharani	Chief, Section of Family Allowances

D. Universities and Training Institutions

Dr Samuel B. Kirkwood	President of American University of Beirut
Dr C.S. Lichtenwalner	Director, School of Public Health (AUB)
Mr A. Akra	Chairman, Dept. of Environmental Health, School of Public Health (AUB)
Dr G. Rifka	Professor, School of Public Health (AUB)
Dr J. Harfoush	Chairman, Dept. of Community Health, School of Public Health (AUB)
Dr Abou Daoud	Professor, Dept. of Epidemiology and Biostatistics, School of Public Health (AUB)

D. Universities and Training Institutions (cont'd.)

Mr Nadim Khalaf	Director, Economic Research Institute, School of Science (AUB)
Dr R. Melki	Professor of Public Health, School of Medicine, French University
Miss I. Garnigon	Director, School of Nursing, French University
Miss Hamsi	Assistant-Director of School of Nursing, French University
Miss C. Sara	Director, School of Social Work

E. International Agencies' Advisers

Dr M. Arousi	WHO Adviser in Lebanon
Mr Mankiker	ILO Regional Office Consultant for the Middle East

F. Others

Mr E. Shebadeh	Chief, Division of Statistics (general directorate of vital statistics, Ministry of Interior)
Mr A. Mirhi	Director of Makassed Hospital

II Documentary References

1. Notre Réalité Sanitaire, by Dr J. Anouti, Director-General of Health
2. "Les Hôpitaux au Liban", Ministry of Planning, July 1965
3. Industries in Lebanon, 1966, Ministry of Economy
4. Annual Report of vital and health statistics for the year 1966,  
Ministry of Health
5. Social Security code 1963
6. Number of Industries in Lebanon, 1964, Dept. of Central Statistics,  
Ministry of Planning
7. Occupational Health in Lebanon, 1957, by Dr A. Bruusgaard WHO  
Consultant
8. Underground water pollution by Eng. F. Abdallah Baltagi, Ministry  
of Health 1967

II Documentary References (cont'd.)

9. Annual Report of Vital and Health Statistics, 1965, Ministry of Health
10. The Lebanese Medical Journal, vol. 20 No. 5-6, Sept.-Dec. 1967
11. Recueil de Statistiques Libanaise, Année 1965, Publié par le Ministère du Plan, Direction Centrale des Statistiques.

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