RF_OH_6_SUDHA

Vitalograph ® VITALOGRAPH TEST RECORD

Ref. Nos.:	
	Date: 6/11/73

Patient's Name RAVI NARAYAN

Address ..... Sex M Age 25

..... Height 178 cms. Weight 57.2 Kgm

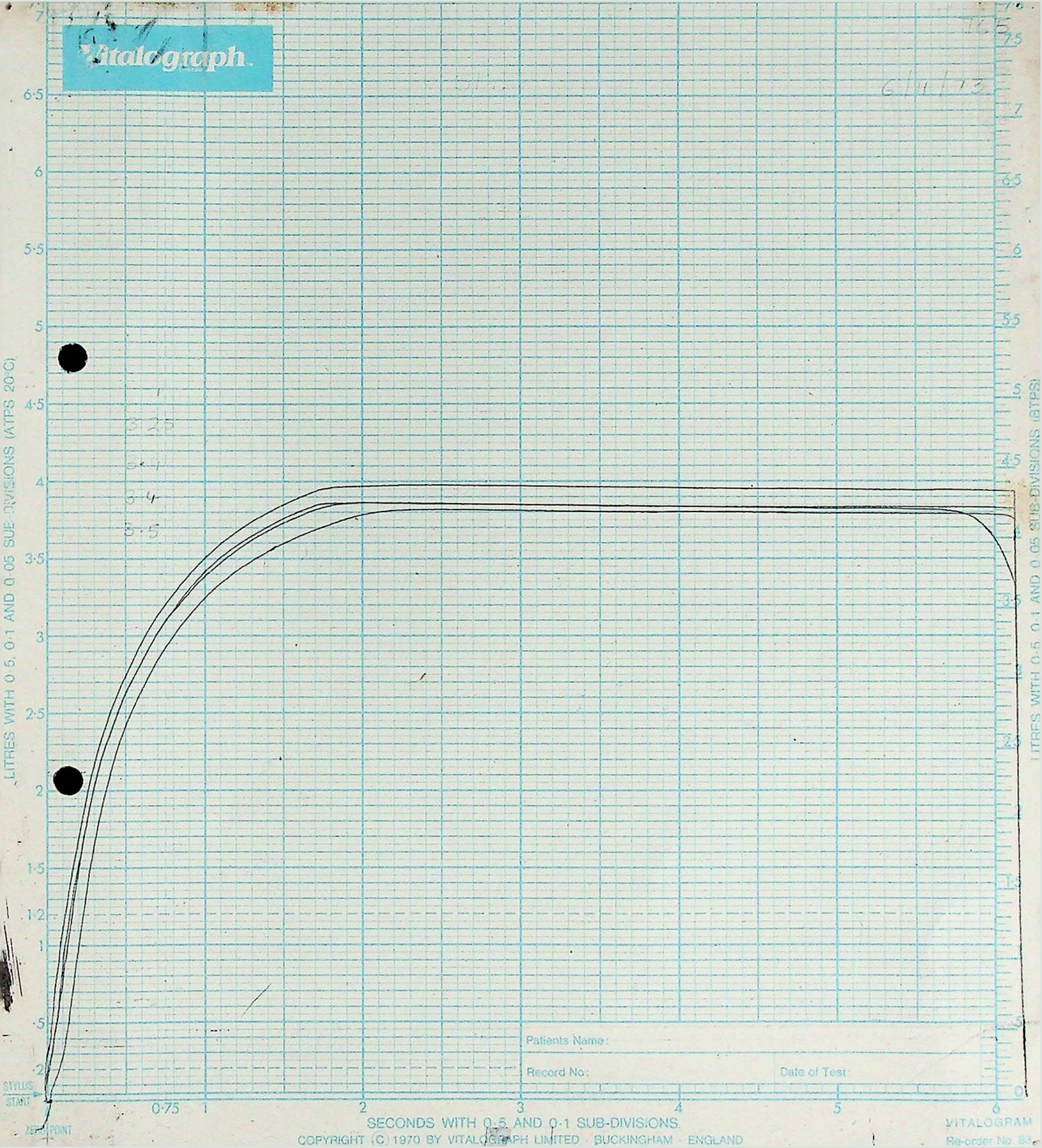
..... Body Surface Area ..... M²

Time of Test 3.45 P.M. Room Temperature 23°C Barometric Pressure 765

Position of patient (e.g. standing, sitting) Standing

Tests	Measured Values in ml			After Bronchodilation					
	FEV₁	FVC	% FEV/FVC	FEV	FVC	% FEV/FVC			
1	3.25	3.99							
2	3.4	3.85							
3	3.4	3.85							
4	3.5	4.0							
5									
Mean									

Other Tests, Remarks, etc.:


Vitalograph
LITRES WITH 0·5, 0·1 AND 0·05 SUB-DIVISIONS (ATPS 20°C)
LITRES WITH 0·5, 0·1 AND 0·05 SUB-DIVISIONS (BTPS)
Patients Name:
Record No:
Date of Test:
STYLUS START
ZERO POINT
0·75
1
2
3
4
5
6
SECONDS WITH 0·5 AND 0·1 SUB-DIVISIONS.
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VITALOGRAM

P R E D I C T I O N S

Vital Capacity (VC); Forced Expiratory Volume in 1 sec (FEV); Forced Expiratory Volume (1 sec)/Vital Capacity (FEV/VC); Expiratory Peak Flow Rate (PF).

$VC = 5.20H - 0.022Y - 3.60$	(l)	(M)
$VC = 4.17H - 0.021Y - 2.87$	(l)	(F)
$FEV_1 = 3.7H - 0.028Y - 1.59$	(l)	(M)
$FEV_1 = 2.5H - 0.022Y - 0.62$	(l)	(F)
$FEV/VC = 91.8 - 0.373Y$	(%)	(M)
$FEV/VC = 92.1 - 0.261Y$	(%)	(F)
$PF = H(395 - 1.51Y)$	(l/min)	(M)
$PF = 374H - 2.12Y - 113$	(l/min)	(F)

Note:

M: Male
F: Female
Y: Age (years)
H: Height (meters)
l: litres
l/min: litres/minute
%: percentage

FACTORS TO CONVERT GAS VOLUMES FROM ROOM TEMPERATURE SATURATED TO 37°C, SATURATED

Conversion Factor	Gas Temperature (°C)
1.102	20
1.096	21
1.091	22
1.085	23
1.080	24
1.075	25
1.068	26
1.063	27
1.057	28
1.051	29
1.045	30

CLINICAL FEATURES

ELDER. L. J.

Male, 49 years, Height 1.72 m., weight 7 Kt.
Smoking· 15 cigarettes per day until 1965 when he stopped.

Provisionally diagnosed as isocyanate asthma in 1972 with 30% disability.

Exposed to methyl di-isocyanate between 1963 and 1969.

No history of chest trouble until 1972. He now is Grade III SOB, slight cough and scanty clear sputum. No cyanosis, finger clubbing or crepitations, rhonchi throughout both lungs.

RESULTS OF TESTS ON: ELDER Lawrence J. EXAMINED FOR: Dr. McLaughlin

EXAMINED ON: 29th October, 1973 EXPOSED TO: Isocyanate

AGE 49 HEIGHT: 1.72 m. WEIGHT: 70 kgs.

All volumes expressed in litres BTPS.

	OBS.	% of PRED.	After Bronchodilator OBS.	% of PRED.
Fast Vital Capacity (FVC)	4.25	100	4.70	110
Slow Vital Capacity (SVC)	-	-	-	-
Forced Expiratory Volume (FEV_1)	2.00	59	2.40	71
FEV/FVC%	47	64	51	69
Peak Flow Rate (l/min)				

	He Dilution OBS.	% of Pred.	Body Plethysmograph OBS.	% of Pred.
Residual Volume (RV)	2.66	131		
Total Lung Capacity (TLC)	6.99	109		
RV/TLC%	38	113		

	OBS.	% of Pred.
Transfer Factor (Dco) Ml/min x mm Hg.	30.0) 28.8) 27.6 23.8)	97

Hyponychial angle: R Index finger 184° No clubbing

REMARKS

The FVC is normal; the FEV_1 and FEV_1/FVC ratio are reduced indicating airway obstruction. The change after bronchodilator denotes some bronchospasm.
The RV is above normal. The TL is normal.
These findings are consistent with di-isocyanate asthma.

CLINICAL FEATURES

Harper, F. A. Male, 53 years, Ht. 1.71 m., wt. 72 kgs.

Smoking· stopped 4 years ago.

Certified asbestosis 1959. Now 60% disability.

1951 - 1959 asbestos sprayer in cinemas, power stations etc. All kinds of asbestos.

1946 AI in the Forces.

SOB Grade IV (MRC Scale) Cough ++ . Scanty sticky sputum.

There was no cyanosis. He had severe finger clubbing and crepitations round both bases.

RESULTS OF TESTS ON: HARPER Frederick A. EXAMINED FOR: Dr. McLaughlin

EXAMINED ON: 29th October, 1973 EXPOSED TO: Asbestos

AGE: 53 HEIGHT: 1.71 m. WEIGHT: 71.8 kgs.

All volumes expressed in litres BTS

	OBS.	% of PRED	After Bronchodilator OBS	% of PRED
Fast Vital Capacity (FVC)	1.65	40	.....	.....
Slow Vital Capacity (SVC)	-	.....	.....	.....
Forced Expiratory Volume (FEV_1)	1.30	40	.....	.....
FEV/FVC%	79	109	.....	.....
Peak Flow Rate (l/min)	.....	.....	.....	.....

	He. Dilution OBS.	% of PRED	Body Plethysmograph OBS	% of PRED
Residual Volume (RV)	2.19	106	.....	.....
Total Lung Capacity (TLC)	3.66	58	.....	.....
RV/TLC%	60	171	.....	.....

	OBS.	% of PRED
Transfer Factor (Dco) 10.6) 9.2) 7.1) Ml/min x mm Hg.	9.0	33

Hyponychial angle: R. Index finger 206° Gross finger clubbing

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REMARKS:

The FVC and TLC are greatly reduced. The FEV_1 is also much reduced but the FEV_1/FVC ratio is above normal indicating proportionate reduction. There is therefore no evidence of airway obstruction.

The RV/TLC is greatly increased but this is due to the fall in TLC rather than a rise in RV; this indicates restrictive defect. The T1 is only one third of that predicted.

These findings are typical of moderately severe diffuse pulmonary fibrosis, presumably asbestosis in view of the history.

Since Feb. 1972 there is slight increase in FVC and insignificant fall in T1. Mr. Harper's function shows little change over the years.

Occupational Medicine

1. Vibration
2. Mental Health
3. Lung Function
4. Dust Diseases
5. Occupational Resp. disease
6. Occupational Cancer
7. Renal Tract Carcinogen
8. Occupational Dermatitis
9. Ophthalmology
10. Colour vision
11. Anthrax
12. Beat Conditions.

MONTH:- SEPTEMBER 1973

ESSO CHEMICAL LIMITED

MONTHLY SAFETY REPORT

	Current Month	Year to Date	Last Year to Date
Injuries			
Trivial	2	37	53
Pot. Serious	0	7	14
Disabling	0	5	2
Total Injuries	2	49	69
Pot. Grave Inj.	0	0	0
Fires	2	13	13
Emergencies	0	4	4

Safety Items of Interest

INJURIES

Date	Job	Department	Unit/ Location	Injury	Description
23.9.73	Operator	CRM	LC-2 Steam Cracker	Chemical dust in left eye.	Dust from contaminated glove entered eye whilst removing goggles
27.9.73	Line Supervisor	Paramins	AP-4	Contused wound right finger.	Jammed in office door.

FIRES/EMERGENCIES

Date

1. 13.9.73
2. 28.9.73

Unit/Location

1. AP-4 Reac Vess R-9
2. Finishing Building

Department

1. Paramins
2. Elastomers

Description

1. Welding sparks caused smouldering of cable insulation.
2. See top of reverse page.

* Fire in Finishing Building : Sack which had been placed over vent section of an extruder to smother a steam leak started to smoulder and caught fire.

PRODUCT LINE	MONTH	THIS YEAR TO DATE	LAST YEAR TO DATE
Chemical Raw Materials	1	6	11
Elastomers	0	30	20
Paramins	1	7	20
Solvents & Chemical Intermediates	0	3	7
Engineering & Construction	0	3	9
Others	0	0	2
1973 TOTAL	2	49	-
1972 TOTAL	6	-	69

OCCUPATION	MONTH	THIS YEAR TO DATE	LAST YEAR TO DATE
B.M./Weld/P.F.	0	3	16
Mech. Fitter	0	1	3
Rigger	0	0	4
M.O.	0	1	1
Others	1	6	9
TOTAL MAINTENANCE	1	14	33
TOTAL OPERATORS	1	35	36

PART OF BODY	MONTH	THIS YEAR TO DATE	LAST YEAR TO DATE
Head	0	11	12
Eye	1	7	6
Body	0	8	8
Arms/Hands	1	14	35
Legs/Feet	0	9	8
TOTAL	2	49	69

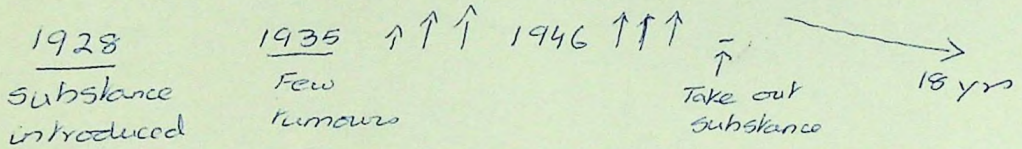
① Hypothesis: The antioxidant introduces an occupational bladder tumour hazard.

Requires the demonstration of

1. Excessive number of bladder tumours in workmen engaged in rubber occupations
2. The increase must persist or be ~~en~~hanced in factories where the substance had been used.
3. The excess should not be present in similar factories where the substance had not been used

② From previous study in Chemical Industry.

Induction time ~~7~~ 15±years



③ Last year to be considered 1951 (Paper published in 1954)

Many cases still alive

∴ Study of death certificates will not give conclusive evidence of the existance or non existence of a risk.

④ Study directed towards

1. Whether increased risk of tumour of bladder in workmen in rubber occupations compd ē total male population of E r W
2. Whether this risk persists in areas where the particular antioxidant under consideration is known to have been used?
3. Whether risk shows temporal change with 1935-36 as pivotal pt

---

⑤ Method

1. Papilloma and Carcinoma — both tumours of bladder.
2. Comparitive (cohort) ~~comparitive~~ analysis — not feasible in this case

: i) No prior appreciation of risk.
ii) Requires full and detailed cooperation ē industry

Sources of Information

E & W

Deaths - tumours of Urin bladder (certfs) acc — 1921 → 51

Estimates of Male Civil population by age group — 1921-51

Estimates insured populn employed in Rubber industry — 1923-1951

Numbers in Rubber occupations 1921, 1931, 1951

Age composition of population as above 1921, 1931, 1951

Occupational history of

County Borough (all hosps)

Bladder tumours - 1936-50 (notified or hosp records)

Mean annual Male Population by age group — 1936-50

Estimates of insured populn employed in rubber industry — 1936-50

Numbers in Rubber occupation 1921, 1931, 1951

Replies relating to occup history of pts (30%)

Age composition of population in 1921

Occupational histories - when stated on case records 20%

Replies from MO of one Rubber I relating to special queries about patients occupational histories.

Results.

i) E & W - Number of bladder tumour death certificates — Statistically significant
Expected and found — in males in rubber occup

1921-35
1936-51

ii) C B - No of Death Certificates
Expected & Found
1936-50
- Not statistically significant — numbers too small

iii) Hosp Reports

No. of Cases in Hosp Reports (alive & dead)
Expected and Found - 1936-50
SRR instead of SMR. — Statistically significan

SMR = Found / Expected.

Other, additional Evidence

1. Tumours in ancillary workers - reported by Case in Chem. Industry.
2. High risk in specific areas of factory
   6-7 from same shed.
   - greater than number of cases expected in C.B.

Hueper 1948 'criteria' for env. hazard

- No work done on
  i) Induction time
  ii) Age at onset
  iii) age at death.

} Since O. cases cannot be differentiated from Non. O

Information Extracted from Data

(1) All cases of bladder tumour - alive or dead - who have come in contact ε hot rubber during its processing or have worked on machines contaminated ε chemical additives.

Classification (a) Death certf + insurable job
(b) Hosp Report + insurable job
(c) All others not in insurable job - but retired worker or previous employment in RT

Table II

(2) Estimates of the insured male population engaged in the rubber occupations for each year

E & W 1921 to 1951

County borough - 1936–1950.

Table IV

Finally adjusted figures — Assumptions

i) demographic structural stability of industry
ii) Part of industry in county is cross section of industry as a whole

(3) Age specific certf rates

For males in E & W by decades From 1921-50

Table V —

(4) Age specific certf rates and 'repat' rates

For county borough. 1936-1950

(5) No of death certf mentioning tumour of bladder that would have been expected to occur in E & W & CB at rate pertaining to gen. male populn of these areas

(6) No. of cases of tumour that would have been expected to be reported from hospitals of CB at gen. male pop^{n} rate.

—

Boiler Room (Two workers)

L.S.H.T.M

Record of

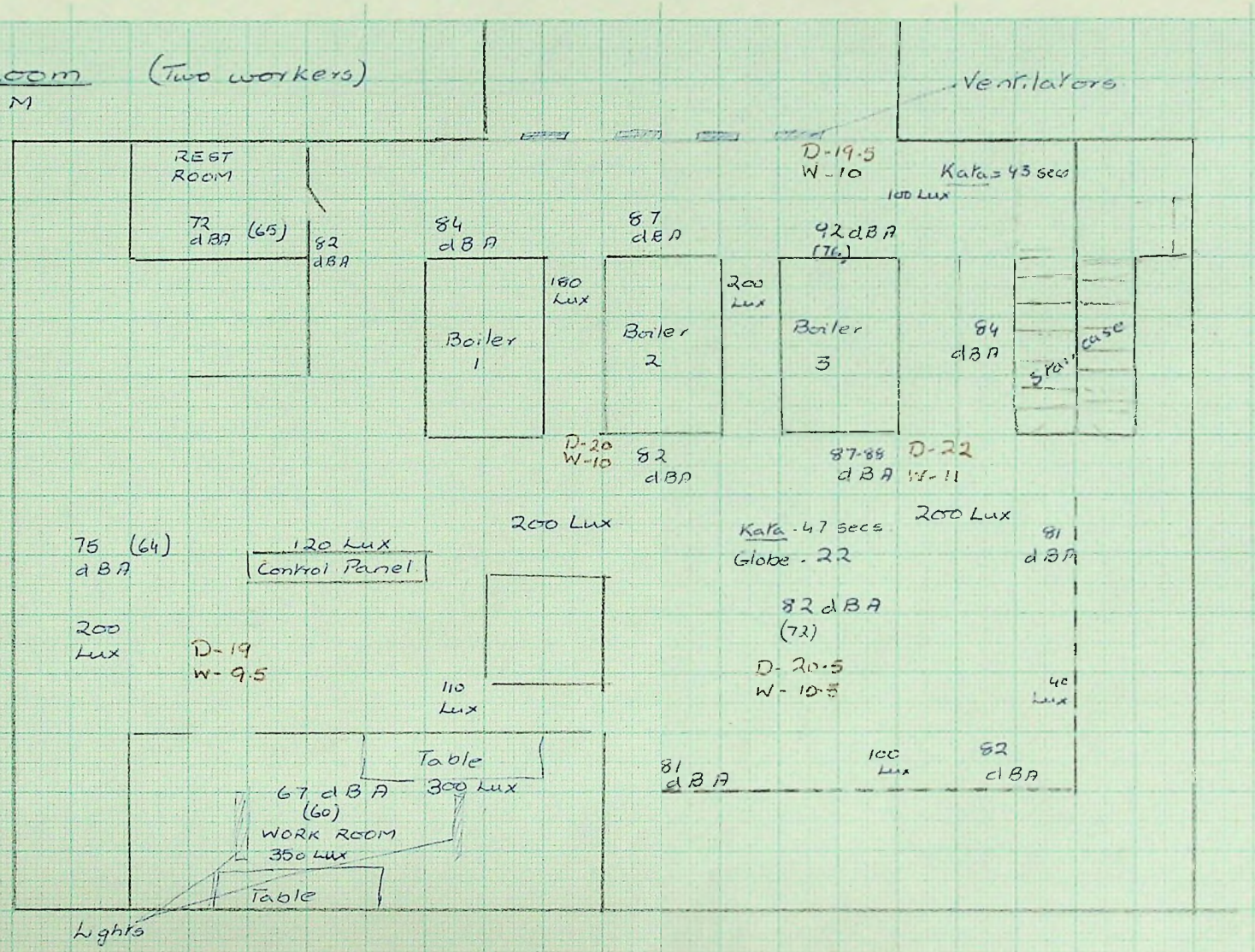
i) Noise

ii) Light

iii) Globe Temp.

iv) Wet + Dry bulb Temp.

v) CO conc^n



- Boiler shuts of every 3-5 minutes (thermostat)
- No co detected by Kirigawa tube.

Kata constant - 496

( ) Noise levels when boiler shuts of.

30/4/73

Examination of Factories - From Health Care point of view

(1) Personnel — Name & Address of Factory.
Management. - pattern.
Personnel Manager
Medical Unit - staffing pattern
- Doctor Incharge.

Employees
1. Number
2. Age & Sex break up
3. Occupational "
4. Housing.
5. Social services
6. Wages.
7. Sickness Absence.] Tact required to get
8. Labour Turn-over] this information.

(2) Premises
a) i) Floor
ii) Walls → Materials
iii) Ceiling
iv) Ventilation.
v) Lighting.
vi) Fire protection. - check dates when filled.

b) Tidiness - lines on ground
- general cleanliness.
- Posters on safety.
fire-risk
First-aid.
- stacking of goods.

c) Effluent disposal

d) Washing facilities & laratories.
e) Canteens.

(3) PRODUCTION PROCESS:

(4) PLANT – Machine design.
Guarding.
Noise levels
Safety factors
Dust risk.

(5) MORALE
i) Whether place is cheerful?
ii) Inter personal relationship?

D.T.P.H.
Course

25/4/73

Occupational Health – I

Health of Worker
Cost of ill health
Sickness absence
Cost of treatment
Workmen's compensation.
Rehabilitation and management of disability.
Accident prevention –

Occupational diseases e.g.

1. Pneumoconeosis
2. Chemical hazards - carcinogens.
3. Radiation hazards
4. Agricultural - hazard of endemic diseases
5. Noise.
6. Atmospheric pollution.

Risks to Worker

1. Injuries
2. Toxic
3. Biological - zoonose
4. Endemic disease
5. Physical - noise, radiation.
6. Occupational psychosis

Risks to Public

1. Effluents - pollution - air, water
2. Physical - noise.
3. Population movement
4. Faulty products ! tinned food, dangerous cars
5. Excessive insecticidal spraying - in agriculture - accidental poisoning from containers
6. Land excavation –
   - accidents, mining.
   - mosq. breeding etc.
   - drainage, Irrigation } problems
7. Problems of urbanization
   - Social
   - economic →
   –

Fit workers to Job

1. Protective clothing.
2. Educate workers.
3. Selection — intelligence
   Physical fitness. — medical exam
   Aptitude tests — psychological tests
4. Job analysis

Fit Job to Workers

1. Environmental hygiene — Heat
   - noise
   - ventilation
   - lighting
2. Ergonomics — science of designing equipment to fit job to worker, reduce disability and prevent accidents

3. Hours of work.
4. Industrial psychology.
   problems: Fatigue
   Boredom.
   Motivation.
5. Organization of work
   - shift work.
   - methods of work

— In traditional skills from buying material to selling finished product was done by the worker

— Mass production in industry has made jobs repetitive and boring.

6. Special diseases which require avoidance of certain job conditions e.g sickle cell anemia —

Slides

1. Climbing coconut tree.
2. Insecticidal spraying of crops.
3. Cyanide gas in grain storage dumps.
4. Tea industry
   - minor injuries
5. Fisherman - accidents,
6. Building sites.
7. Quarrying.
8. Cotton gin.
9. Carpenters shop
10. Wood industry.
11. Mining.
12. Large industries.
13. Pepsi cola Factory.
14. Laboratory

27/4/73

OCCUPATIONAL DISEASES

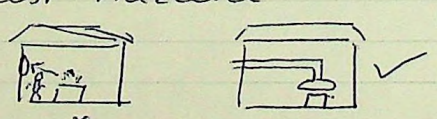
Before starting occupational Health Service in a industrial unit determine.

1. What type of Industry?
2. Organisational set up proposed - no. of workers
3. Raw materials and products - known hazards or toxic effects.
4. Recognition of hazard - I

Principles
- chemicals
- Siting of factory
- research
- monitor effect on people if hazard not previously reported.

5. Substitution - II whether possible
   - Titanium instead of Pb
   - Shot blasting - instead of sand blasting.

6. LIMITATION - III
   (a) Smallest numbers exposed
   (b) Limit space of exposure
      - Total enclosure
      - partial enclosure
      - Remote control handling.
   (c) Proper exhaust ventilation - esp if dust hazard



   (d) Reduction of dust hazard -
      - by moistening area with water (wet working)
   (e) Underground ducting

f- Time of exposure reduced.

IV- MEASUREMENT of Hazards
- Occupational hygiene labs.
- Maximum allowable concentrations or 'permissible' or safety levels.

V - Protective Clothing
- Gloves
- Masks
- overalls
- boots or shoes
- Crash helmets
- Glasses
- Lead aprons
- Spectacles, goggle, shields
- Asbestos attire
- Ear muffs + plugs

VI - TRAINING AND HEALTH EDUCATION
- Short introduction or course

VII MEDICAL SELECTION - i) at the time of entry
ii) regular medical check up.
iii) Selective placement.

VIII - LEGISLATION
i) Factory Acts and Regulations
ii) Workmans compensation Act
iii) Employment State Insurance.

IX EXERCISE AND RELAXATION

MEASURES of adaptation to job, and morale of workers

1. Sickness absenteeism
2. General "
3. Strike Action
4. Accident Rates.
5. Productivity.
6. Labour Turnover.

OCCUPATIONAL HYGIENE

Control of Environmental Conditions in Factories.

1. LIGHTING
   - in the workshop - depends on type of work
   - in the corridor
   - administration offices - 50 lumens
   - operating table . 100-150 lumens

   Apparatus for measurement - Lightmeter.

   Rule: i) Local lighting not more than square of general lighting.

   ii) Prevention of glare.

   iii) Use of colour codes and symbolic colouring of equipment, walls etc.

   Red: Danger or hot

   Green: safe: Blue: cold.

2. TEMPERATURE — Thermometer.
3. HUMIDITY — Hygrometers
4. AIR MOVEMENTS AND VENTILATION

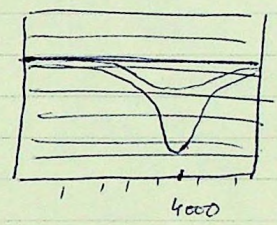
— gives composite picture of working environment

Suggest:

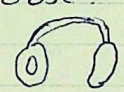
i) Baffle walls to keep out heat

ii) proper ventilation
iii) adequate air vents
iv) Air conditioning or fans
v) Reflecting surfaces

5. NOISE
- measurement in Decibels.
- noise-level instruments available.
Deafness - of individual workers measured by audiometers.



Control of Noise
i) Minor technical repairs or modification can decrease noise.
ii) Ear-muffs



Maximum level of safety = 85 dB
- Jet aircraft = 120 dB

6. RADIATION
i) Geiger counters
ii) Film badges.
iii) Ionization chamber
iv) Blood counts - statutory requirements in certain factory acts.

Prevention
i) Protective clothing
ii) protective storage
iii) Disposal of radioactive waste (properly)
X-ray material used in many industries

7. Chemical Hazards i) mineral
ii) gases.

- Use of special pumps - Kitigawa
- spectrometers

8. AIR POLLUTION

- H_2S, CO, SO_2
- Benzpyrenes

] Meters to measure these agents

Control

i) Gas masks

ii) Early detection of effects → Lung function tests.

9. DUST hazard

Measurement: i) No. of particles per cu. metre

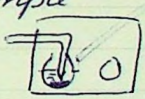
ii) Weigh the dust - air passed over filter paper which is measured before & after

a) Hexhlet
b) Cascade impactor
c) Conicycle
d) Electrostatic precipitator

] To measure weight.

To measure particles per cu. area

a) Conimeter by 'grab sample'
b) Midget impingers.
c) Thermal precipitator.



Average dust level should be worked out by (c). Sometimes peak level should also be determined because it may be far above permissible level

7/5/73 Occupational Health Dr. Hall

Studies 1. Medicated salt programme in Uganda.
2. Asbestosis

Factors: Dose effect measurement
- disease effect
- Sub optimal performance.
Determination of safe levels

Average exposure and Maximum exposure

- Physical agents, radiations
Chemicals and material
Biological contaminants

- Sensitive and reliable instrument
Standardisation
Calibration
Systematic Sampling.

Equipment
1. W.B.G.T Meter.
2. Decibel metre - sound level
3. Photometric.

Sub optimal performance
1. Studies in Agriculture in the tropics
i) Energy expenditure
ii) Respirometer
iii) Effect of mechanization
iv) Weight lifting techniques
v) Back injury rates

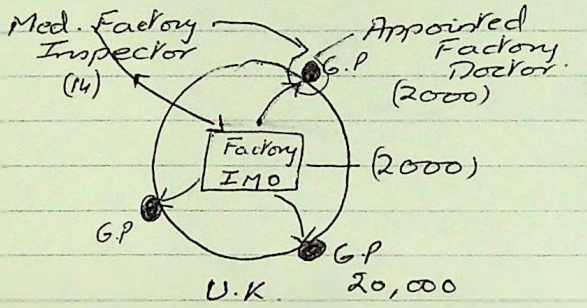
9/5/73. OCCUPATIONAL - HEALTH Dr Schram

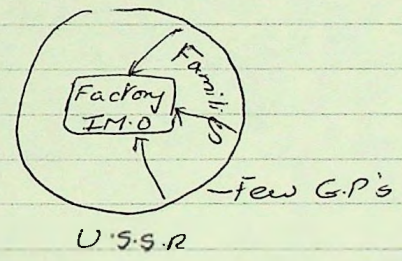
Organisation: Ministry of Labour

↙ Factory Inspectors

↘ Specialist inspectors
i) Electrical
ii) Chemical
iii) Physicist
iv) Health — Med. factory inspector
v) Occupational Health Consultant
vi) Mining consultant

In U.K - Occupational health does not come under N.H.S.





- Notifiable industrial diseases
  i) Anthrax
  ii) Poisons
- Communicable diseases - identification and notification

- Doctor population ratio in Ind. health services is 1:500 - 1:2000. Many factors which determine this
  i) Type of industry
  ii) Risk of hazards
  iii) Resources available.
  iv) Schedule of work - curative, preventive and follow up
- Small factories can group together to form an

occupational health service.
- Staff of doctors and nurses can be temporary, or full time.

- I L.O - i) Recommendations
ii) Functions
- Surveillance.
- Advise to management
- Jobs analysis
iii) - Pre employment exam
- Retraining.
- Rehabilitation
- Emergency treatment and first aid
- local personnel.
iv) Organisational and finances

I L.O.

1. Consultation services
2. Training - awards, fellowships
3. Symposia conferences, courses — management
— med. nursing
— " auxiliary

4. Publications: i) Model codes. manuals.
ii) Standards for pneumoconeosis against x-ra
iii) Recommendation
iv) Conf. Reports and proceedings.
v) Occupational safety + Health services
vi) Enylopedia
5. Research. vii) CIS card index - abstracts
viii) Specific hazards
ix) Technical reports

6. Rehabilitation and care of the handicapped.
7. Joint activities ≈ W.H.O, F.A.O, UNICEF, IAEA.
8. Health of seamen from 1919
   - Ship captains manuals for emergency medical services.
9. Safety problems in industry.

Rehabilitation:

Ref: Help for Handicapped people
   - prepared by Dept of Health and Social Security and the Welsh office

14/5/73 PNEUMOCONIOSIS Dr. R. Schram

Dust diseases

Mineral		Disease
1. – Sandstone, slate, flint – Mining – tin, coal, gold (work through silica) bearing rock – Foundry workers – Brick works – Knife grinders	→	SILICOSIS (Progressive disease) Tin – Stanosis (no disability).
2. Coal Workers		Coal workers pneumoconeosis (not only silicosis.) (some link ε TB.) Progressive Massive Fibrosis
3. Asbestosis miners. Workers of asbestos products		Asbestosis Mesothelioma Cā Lung
4. Cement industry.		Chronic Bronchitis.
5. Heavy metals – in foundries Beryllium Manganese		Acute pneumonitis
6. Pesticides (chemicals)		Acute lung conditions

Vegetable

1(a) Cotton – gins, textile card-room, blow-room spinning, weaving.	Byssinosis. (Monday fever)
1(b) Flax.	"
(c) Jute	
2. Sisal	Byssinosis, bronchiectasis pneumonitis.
3. Sugar-cane dust paper manufacture.	Bagassosis.

4. Hay, mouldy products — Farmer's lung

SILICOSIS

- International classfn of xray findings (ILO standards)

Diagnosis

1. History - Full
2. Clinical signs & symptoms
3. Sputum.
4. Xray.
5. Lung function tests ↓
6. Biopsy & other investigations - if tumor is suspected

Prognosis — mill fever? at the first exposure

1. History. — contact ∈ dust
2. Sputum
3. Xray - often no change - slight emphysema.
4. Lung F.T. ↓

Classfn
½ - ill defined
1 - Mondays
2 Mondays + Tues +
3. Total disability.

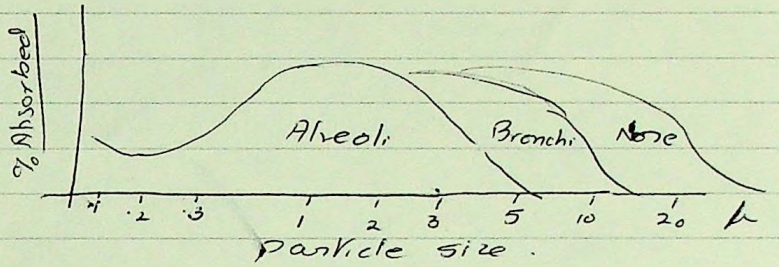
Farmer's lung

1. Allergic response to thermophilic actinomyces.
2. Cough, dyspnoea and Pyrexia and malaise
   - 3-12 Hrs after exposure
3. Xray - may see miliary appearance
4. Lung F.T. ↓.
5. Skin tests not useful.

Lung function Tests

1. Vital Capacity
2. Timed "
3. Forced expiratory volume - FEV_1 — 45 likes (less than 2 = disability)
   - Spirometer
   - vitalograph.

Particle size



Particle states

1. Gas
2. Vapour - gas in equilibrium ē liquid
3. Mist - cloud of liquid droplets ○
4. Fog - particle in " ◎◎
5. Dust - mechanically generated particulate matter ⁘
6. Fume - chemically " " ⁘ (Pb)

Effects

1. Dermatitis
2. Sensitivity and allergy
3. Explode

DUST CONTROL

1. Substitution
2. Built in protection
   i) Total enclosure
   ii) Partial enclosure
   iii) General and local exhaust ventilation – as near as source of dust
   iv) Vapour hoods
   v) wet working
3. Protection of workers
4. Training & Health education

Legge Aphorisms:

1/10/73

MANS WORK AND HIS HEALTH

Prof Schilling

Occupational Health aims to

1. Protect
2. Improve. the health of all classes
   Kinds of workers.

Two components

O.M - concerned primarily c man and the influence of work on his health.

O.H - concerned primarily c mans Environment.

How work can affect health?
How health can affect work?

Three interactions

1. Work may give rise to disease or illness (occupational)
2. " " aggravate illness (non-occupational)
3. Pt's illness or disability can affect his ability or capacity to work

What is the pt's occupation.?

1. Has it caused his illness?
2. Is it likely to aggravate his illness?
3. Does the pt's illness, or the disability it causes, affect his ability to pursue his occupation?

3 persons involved. - Occupational health physician
nurse
hygienist.

Physicians & Hygienists have responsibilities for the
Recognition
Measurement
and Control of Health hazards in the
Physical and psychosocial environment.
Similar responsibility lies with all personnel involved in health care of patients or people.

Worker i) Main job.
ii) Moon-lighter
iii) Hobbies – Amateur boat painters.
Pottery, House painting, gardening.

Bernadino Ramazzini (Early 18th century) Father of O.M
In history-taking Man's work important.

—

Difficulties in identification of Occ. D.

1. Awareness
2. Asking right questions

— Mimicry of occupational diseases

1. Acute abd. pain – Acute Pb poisoning
Heat cramps
2. Blood diseases –
3. Kidney disease
4. Organic nervous disease

5. Behavioural disorders
6. Bone & Joint disease
7. Liver disease – CCl_4, Chlorinated naphthalenes, dinitrobenzene
8. Respiratory disease — dinitrophenol, T.N.T.
   - Coal workers pneumoconiosis
   - Asbestosis.
   - Beryllium.
   - Cadmium.
   - Di-isocyanates.
   - Organophosphorus compounds
   - Vegetable dusts (Bagasse, Cotton, Hemp)

Behavioural disorders
- Boxing.
- Carbon disulphide
- Lead (inorganic and organic)
- Manganese
- Mercury (inorganic).
- Trichloroethylene.

Causes of Peripheral neuropathy

Bacteriotoxic.	Vascular
Viral	Neoplastic
Mechanical	Degenerative
Chemical	Idiopathic
Metabolic -	

Pb, C sulphide.

What STEPS taken for IDENTIFICATION

1. History symptoms + signs
2. Group approach. – ? others on same type of job
   ? similar signs + symptoms

Occupational History

New Employee
1. What job are you doing.
2. List jobs since leaving school

Company	Job	From	To.

Current Employee
1. What is your present job?
2. How long have you been doing it?
3. How many years have you been in the company.

---

1. Present Job — materials handled or processed
2. Past Jobs

Types of illnesses

1. Occupational.
2. Non occupational exacerbated by occupational
3. occupational ppkd by non-occupational disease
4. Illness jeopardising work efficiency
   Bus drivers — Airline pilots.
   Food handlers — Executives

2/10/73

PROJECT - A

Peterborough Town: Population 88,000 → 190,000

Jobs available 37,500 → 54,500

↘ 27,000 (purely industrial)

1. Plan for occupational health service
2. Forecast difficulties of development.
3. Alternative solutions.
4. Costing and budgeting.

Importance of Town: 1. Important Rail line to North Industrial Area.

2. High-way A1

Options: 1. Allow med. service to be developed by each individual form

2. Plan organised health services

Option 2 was accepted and a Brochure sent round to firms which stated.

1. Need (Do you know)
2. Occupational. H. Service. What it is?
3. What Peterborough " will provide.
4. What you gain?

Plan

(1)

1. How many industries? Type? Future development
2. Market Survey of Industries re: Health Services
   i) existing services in firms - manpower etc.
   ii) Requirements of each firm.
3. Defining what O.H.S will provide?
4. ? Involvement in siting of industries
5. Need to consult or include previous health personnel providing services
6. Deciding what type of O.H.S will be suitable for town? - nurse intensive, mobile, doctors etc.
7. How 15 yrs projected - stages or landmarks?
8. Effects of new development.
   i) Joining E.C.C.
   ii) New legislation - E.M.A.S. Employer Medical Advisory Service.
   iii) Political trends.

—

9. What grants are available - what sources can be tapped?
10. Minimum requirements for a service to be viable.

—

(2)

1. Why does Peterborough need O.H.S will be organised?
2. Get person interested in group O.H.S.? as a pilot project or research project?
   i) C B I - Confd. British Industry.
   ii) Nuffield? iii) T.U.C?

Ref: R.N. Hill — Trans of Soc. of occup. Med. Vol 22 No1 1972

3. Planning < Employers - want
Planners - medical + non-medical
Unions.

5 yrs.
10,000 people and 10 firms (for viability)
£5 per person per annum.
Free building provided. - may not be suitable.
Central service & satellite centres, which
can possibly become autonomous at a
Present G.P's to be invited later stage.
— head satellite centres
— or continue as part of localised servic
Satellite centres should be linked with local
health services (no pt. in duplicating).
Person who plans —— Research commitment
University base
More objecti

Budget 20-40-000 — From Industry + Loan or grant
Doctor - 5,000 from Dev. Corp

4. Energise Unions more? ——

Why O.H.S= i) ? Legislation
ii) ? Fear of Hazard.
iii) ? Altruism.

Vol. 22
No. 1
Jan 1972

—

Options

1. Sell idea to Employer
2. Organise Labour unions - energise them to demand facilities after needs defined
3. Organise community opinion. - 'community politics'

Difficulties

1. Chairman - Type, connections
2. Doctors
   i) vested interest in part-time employment in industry.
   ii) Position in local doctor community, of spokesman
   ii) Reactionary response of doctors who do not visualise involvement.

Medical Costs and Budgeting.

D. S. F Robertson.
Trans Soc. Occup. Med.
(1969), 19, 21-22

Suggested form of simple budget headings are.

(1) Renumeration and Social Insurances —
- Medical officers
- Sisters
- Nurses
- First Aid personnel
- Ancillary services, less fees recovered.

(2) Consumable Material — Drugs
Dressings etc.

(3) Equipment
Instruments and other non-consumable items.
Depreciation of capitalised equipment.
Maintenance.

(4) Services
- Lighting & Heating
- Water
- Cleaning (including labour)
- Laundry
- Plant maintenance
- Other services

(5) Stationery and Printing

Travelling (including cars)
Sundries
Accomodation .... sq ft at s. d. per sq ft.

Note: 1. Per capita figure (total costs divided by number of employees) is only meaningful if some allowance is made for personnel not on site but to whom the service is available (sales representative, overseas personnel)

2. In a large-scale O.H.S. it may be sensible to submit major items for capital expd. for central authorization.

—

3/10/73 Information and Advisory Service Dr. Jones

Types of services

(1) Information only
- a) Abstract services - Renew
- b) List of References
- c) Commentary
  - a) original (by institute)
  - b) by other authors.

- postal advise
- may not necessarily take d) into account local factors → may comment on your particular situation

(2) Information + Field Consultation
+ Fieldwork for extension of known knowledge
↓
assessment
↓
controlled studies - research investigation.

(3) Abstracting Journals and Publications

Reasons for dissatisfaction of Consumer or Advisor

1. Type of Problem
2. Specificity of question
3. ? question sent to right source
4. Information in question omits important and relevant information.
5. Wrong question asked.
6. Psychosocial problems.
7. Questions asked for other purposes e.g. Getting information - otherwise not easily available thru usual channels.

How to word the question?

① Get to know what Inf or Adv service is like (personal visit always better!)
- what standard.
- what type of language spoken

② Use domestic source of advise first.

③ Interrogation of local personnel and survey of problem and analysis of findings.

④ Problem content - Epidemiology.
Classify. Clinical
Toxicologic.
Ergonomic.] implications
Safety & Prev]
Delivery of care - Nursing & First Aid - implications

⑤ Domestic resources
- check previous records
- meet previous M.O's.

⑥ Finally Formulate question and contact I & A service
(Put not your trust in False prophets).

3/10/73

FIRST-AID PRACTICE AND TEACHING

Dr. A. Ward Gardner

① Life saving first aid for casualty → unconscious not breathing or bleeding.

Teaching shd be as simple and practical as possible.

② Better trained First aiders — Priorities

③ Informing groups - all workers, schools et — Steps.

The greatest ban to knowledge is learning.

—

- Electric Shock — Unconscious position
- Cardiac arrest — ?thump heart → hospital
- Mass casualties - Call for Help, Sort into i) Dead or dying
  ii) Screaming.
  iii) quiet - falling into one of above

Slides - Camera Talk - 31 North Row.

- No competitions - role enacting useful

←

Pan Books
1. New Essential First Aid - A. Ward Gardner.
2. (For children) New Safety and First Aid (Adult's 30p)

4/10/73 History of Occupational Diseases Dr Schilling

Factors in Development

① Status of Worker

a) Mines of Egypt - complete disregard of worker because he was slave or criminal
- conditions impositive
- unskilled jobs

b) Miners in Europe (Middle ages) were serfs
- As 'coinage' grew work became more skilled
- skilled serfs reqd ∴ lead to emancipation
- they organised themselves into groups.

② Recognition of hazards

c) More representatives in important committees - leading to great interest in workers health

d) Worker's State (Political) - of USSR and East European countries.

e) Sweden & USA - Contracts between Employers and Trade Unions.

③ Quantification - How much hazard?
How many workers affected.

Mid 19th Century Greenhour - Ber. Med. St. Thomas' Hosp Use of Reg Gens statistics Resp diseases in Lead workers

Fishermen Accidents.

Asbestos & Lung Cancer. R. Doll., Brit. J. Indust. Med (1955) 12, 87

④ Humanity

a) Influence of Liberals - Rousseau, Voltaire, Jefferson

Humanists - John Howard,

7th Earl of Shaftesbury - J. L & Barbara Hammond

Early Factory Act (St. Giles) - Reforms in Child Labour

Robert Owen - Manager of New Leonard Mills - Scotland
Socialist & Atheist.

'Quakers' -

⑤ Economics: Does it Pay?

Cost effectiveness studies

⑥ Standard of Health Services outside

⑦ Legislation USA - Federal Act OSHA

UK - E.M.A.S.

8. Commercial reasons:

4/10/73

PROJECT - B

(1) - Insufficient information.

a) ∴ - Write a brief information review on the matter as a holding exercise

What is Coronary heart disease - in laymens terms

Multifactorial aetiology - State important factor

Types of presentation Male, Older age groups Obesity, ↑Ch., Smoking, sedentary occup.

Figures from Regr. general's report

Occupation & Mortality - constitution of personnel

- mental strain of particular job (compulsive workers)
- physical activity
- Occupational Toxic causes

CS_2, Nitroglycerine manf. nitrobenzene. (Chronic exposures)

b) Copy of the paper read by local G.P must be obtained.

c) Survey repeated by mortality statistics of total work force over 10 yr period (if records available)

d) Similar Survey shd be done on another assembly line of comparable work in another branch of firm if possible.

e) If 'c' and 'd' produce same result than problem exists

f) Then consider prospective survey.

g) Method of counselling instituted - for vulnerable group identified

? whether matter only a "Flashpoint" for underlying disputes.

- Highly Paid ? Factor for low turnover
- ? How to compare excess of deaths
  ? - general population of same age-structure
  ? - workers in other dept of same ,,

- If Survey shows that mortality is significantly above gen. rate (ie agrees ~ G.P. Paper)

What to do?

1. History of previous occupation of Assembly line workers (Viscous Rayon - Chronic exposure to CS_2 vapours)
2. Age structure ? higher because low turnover rate
3. History of Plant disputes
4. Effect of shifts ?
5. Boring, repetitive jobs on assembly line.
6. ? Health & safety committee. -

Ref. i) CS_2 toxicity
ii) Nitrobenzene ,,
iii) 'Vdvo' experience

5/10

Introduction to Ergonomics

Ergonomics - Scientific study of human performance and human factors in work, machine control and equipment design.

WHO - Getting man and machines to live comfortably together

1. Consider mans functions and requirements
2. Plan machines function to suit man functions
3. Man working machine efficiently and comfortably

Aim - To fit everyone ie in 5th-95th percentile in ergonomic design.

e.g.
i) Office desk - 28" - Desk
17" height x depth of chair
10" height of back rest

ii) Drivers seat in a bus

Need Equipment
1. Tape measure
2. Camera
3. Ability to collaborate with everyone involved users, engineers, research workers
4. Thick skin ie a determination to be in on the design project from the very start.

Ref.

1. Ergonomics' Journal Taylor & Fracis Ltd
10-14 Macklin Street - London WC2B5NT

2. Human engineering guide to equipment design
Mcgraw Hill Morgan, Cook, Chapanis

3. Ergonomics - K.F.H. Murrell.
Chapman & Hall

—

Discussion - on use of Ergonomics for Victoria Line
- Ticket collecting gates
- Drivers cab in front of train.
- control panel.

—

5/10/23 — Ionising Radiations — Dr S. Chare

① Importance of subject — Nuclear power / Nuclear weapon

② Structure + properties of matter.

Elements 90 natural 11 (laboratory)

Molecule, Atom

Sub atomic - proton, electron, neutron

Mass	1	·00054	1
Charge	+1	−1	0

Atomic number – Number of Pr present in an atomic nuclei which defines the element H_1 HB_2 Li_3 .. C_6 .. Ra_{88} ... U_{92}

Electron orbit = shell . Upto 7 are present which are name K (innermost), L, M, N, O, P, Q (outermost)

No Cl – never more than 8 in the outermost shell.

– Those elements which have similar number in their outermost shell are related in function e.g. Fl, Cl, Br, I are halogen ∴ 7 electrons in the outermost shell

– Na^+ Cl^- → NaCl in water → Na^+ Cl^-

Ions are charged particles derived from atoms which have lost or gained 1 or more of their orbital electrons.

Properties of ions are different from those of elemental particles

- Chemical 'nirvana'
- Neutron - affects wt of element

Mass number = Sum of Pr & N in an atomic nucleus

H = 1 C = 12 Ra - 226 U = 238

$^{12}_{6}C$ C^{12}_{6} Ra^{236}_{88} U^{238}_{92} $Element^{Mass\ N}_{Atomic\ N}$

C_6 12 13 14

Carbon 99% C^{12}_{6} (6 neutrons

1% C^{13}_{6} (7 n)

1 in 10^{12} C^{14}_{6} (8n)

Isotopes - varieties of atoms having ~~same~~ different mass numbers

Atleast 3 isotopes isolated from each element

Atomic Wt - Average mass number of mixed sample of isotopes.

13.46

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③ Radiation

Discharge of a charged particle or particles from an elemental atom - Radiation

- All elements above Bismuth 83 are unstable and therefore radioactive

Po_{84} At_{85} Rn_{86} Fr_{87} Ra_{88} Ac_{89} Th_{90} Pa_{91} U_{92}

Types of particles	Mass	Charge	
α particles	4	+2	Large traverse 3-5cms when discharged into the air - low penetrating power - easily screened - cannot pass thru unbroken skin - very destructive of living tissue within short range - Radium needle (α emitter) used in destruction of malignant tissue

B particle Mass = 0 charge = -1 lighter particle.

- Traverse about a metre in the air
- can be screened by a sheet of light metals - Zn, Al
- can penetrate skin
- If acess to body - destructive of tissue.

Theory - Neutron - disintegrate releasing B particle and the atom gains in the charge

γ rays no mass, no charge

electromagnetic radiations of very short wavelength, energy released due to violent shuffling of structure of atom to get nuclear equilibrium.

Traverse very long distances (Hiroshima 1 mile

- High penetrability
- Pb screens required.
- Destructive of living tissue.

Disintegration of elements continues in nature down the chain till Pb^{206} is reached when radiation ends.

Radium has half life of 1620 yrs. Time taken for half of the given sample to decay.

Half life - most extended time scale in nature.

U^{238} 4.5×10^9 yrs — Ra 1620 yr — Rn 3.8 days — Po^{212} 3×10^{-7} secs

Radiation - cannot be hastened
- cannot be neutralised

Radioactivity cannot be destroyed. ∴

1. Concentration and storage
2. Dilution and dispersal.
3. 'Radioactive Refuse disposal ~~service~~ Service' - Rockets into outer space

(4) Naturally occuring radioactive materials

C^{14}: Radioisotope of carbon, β emitter
½ life of 5100 yrs
Useful in dating of archaeological finds.
Body contains minute traces of this carbon = body burden of radioactive C^{14}

K^{40} Radioisotope of Potasium, β emitter
1:10,000 of all K isotopes.
Also present in body = Body burden

Artificial - Bombarding of elements by neutrons in nuclear reactors

Neutrons - 2 types - Fast + slow (depending on velocity)
Fast ⟶ transmutation (Ri of different element)
Slow ⟶ capture (Ri of same element)

Neutrons - are by products of nuclear fission
Association with U^{235}
Chain reaction → controlled and modulate release of energy.

radionuclide = man made - radioisotope

---

⑤ Effect of Nuclear radiation

Ref: Lancet, Sept 15th 1973

Effect of radiation is ionization.

Elec, Pr, N, α, β, γ rays & x rays can produce ions

Ionising radiation

One electron dislodged can produce a 'ion-pair'

⑥ Measurement

Detected by i) Film badges
ii) Geiger counter
iii) Ionising chamber
iv) Scintillating counters

Curie 'c' - strength of radiation at source
- unit of radio-activity
= 37×10^9 disintegration/sec

m.c	10^{-3}
μC	10^{-6}
pico.c (pc)	10^{-12}

roentgen 'r' unit of ionization in air. Exposure does
= 2×10^9 ion pairs / c.cm.

mr	$= 10^{-3}$
μr	$= 10^{-6}$

Absorbed dose

rad = radiation absorbed dose
- based on concept of energy transfer
= that amt of radiation which produces 100 ergs/gm of energy transfer in tissue

m rad 10^{-3}
μ rad 10^{-6}

rem rad equivalent
= rad × Rel biological effectiveness

m.rem = 10^{-3} reb = 1 for β particles electrons, x rays, γ rays
μ.rem = 10^{-6} re.b = 10 for α particles

∴ rem = rad = r

Background radioactivity

Natural

Extraterrestrial Cosmic rays 23 mr.

Rocks (earths crust) 43 mr

Radon (gas) 1 mr
(disintegration of radium in the earths crust)

Internal K^{40} = 20 mr
C^{14} = 1 mr
Respⁿ + food = 2 mr

Average Annual exposure = 100 mr

In 30 yrs = 100 × 30 = 3r maximum permissible radiation

Natural background = 100

Man made

Med. radiology	20%	— Important.
Industry	1·5%	
Clocks (dial)	1%	
Television	< 1%	
Fall out	< 1%	
	25%	

Ultra violet

Carbon arc.

Tungsten lamps

Mercury vapour lamp

Lasers

Metals heated over 300°c

8/10

National Health Services

Dr Acheson

Department of Health and Social Security

↓

Regional Health Authority - 12 ← Regional Team of officers

↓

Population — AHA ← Area Team of officers

160,000 - 8 million

← District Management Team

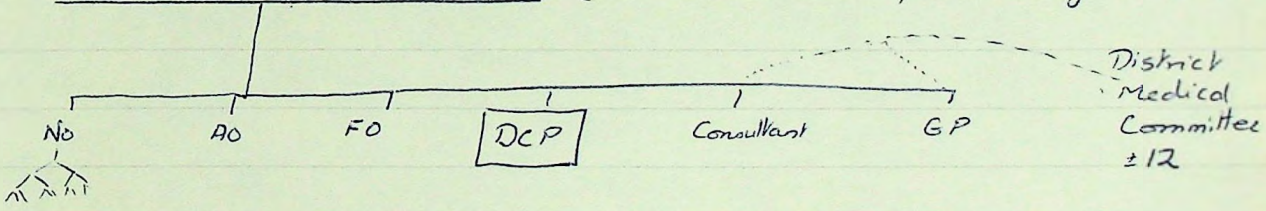
District Health Authority

150,000 – 250,000 (Critical Population Unit)

RTO + ATO have Specialist in Comm. Med.
Finance offices
Administrative offices
Nursing "

DMT have in addition
+ G.P
+ Consultant

DISTRICT MANAGEMENT TEAM (Decentralized planning unit)



Health Care Planning Teams
- Maternity Service
- Child Health — DCP, Paed, SN, HV, Soc.W, GP
- Geriatrics
- Mental Health

District Community Physician

1. Coordinates within the DMT of services of planning.
2. 'Consultant' make available his knowledge to his colleagues
3. Epidemiologist.
4. Advisor to and manager of services for local govt (more at area)

8/10

Proposed New authority on Health and Safety at work

My Locke

Factory legislation from 19th century

↓ 1. Children.
2. Women
3. Special risks
4. Lead hazards
5. Factory Act
6. Offices + Shops

— E.M.A.S.
— Organization and integration of all inspectorates

New fields

1. More long term inspection + care.
2. Prevent possible hazards at 'design' stage of equipment
3. Make work situation more pleasant (silencing of noisy operations)

8/10/73 Biochemistry - I Dr Smith

Acids, Bases, Ions

Molecule $\xrightarrow[\text{gain}]{\text{Loss}}$ Ion
e, p

$HCl \longrightarrow H^+ + Cl^-$

$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$ Hydroxonium or Hydronium ion

$NH_3 + H_2O \longrightarrow NH_4^+ + OH^-$

Rule: $HA + H_2O \rightleftharpoons H_3O^+ + A^-$ A = Acid

$B + H_2O \rightleftharpoons BH^+ + OH^-$ B = Base

Acid donates a proton to the water and a Base accepts a proton from water (Lowry & Bronstead)

Any substance which donates a proton to any other substance is an 'acid' in classification
Base - proton acceptor Acid - proton donor

Acid $\underset{H^+ +}{\overset{-H^+}{\rightleftharpoons}}$ Conjugate base

$Acid_1$	$Base_2$	$Acid_2$	$Base_1$
CH_3COOH	H_2O	H_3O^+	CH_3COO^-

Strong & weak acids Strength of an acid is the Tendency of an acid to donate a proton.

Strength of base - tendency to accept a proton

pH $-\log_{10}[H^+]$ Scale 0-14 7 - neutral pH

$HA + H_2O \rightarrow H_3O^+ + A^-$

$K = \frac{[H_3O^+][A^-]}{[HA][H_2O]}$ = Equilibrium constant

Ka greater than 1 = Strong acid

Less than 1 = weak acid

$pKa = -\log_{10} Ka$

Henderson Hasselbach equation = $pH = pk + \log \frac{[acid]}{[salt]}$

- Peptide chains — Amino acids - sequential chains
- Helix.

Nucleic acid - Macromolecular structure

- Free or combined ē protein (nucleoprotein)
- divided into DNA & RNA

RNA - cell cytoplasm — involved ē protein synthesis

DNA - nucleus — mainly genetic material

DNA - Adenine & Guanine (Purine bases)

Cytosine & Thymine (Pyrimidine ")

RNA = Uracil in place of Thymine

Bases attached to Sugars (Pentose sugars)
DNA - Deoxyribose RNA - Ribose
by phosphate linkages (esters)
Phosphoric acid esters formed.
Base + Sugar = Nucleoside
Base + Sugar phosphate = Nucleotide.

Base pairing A-T G-C

Enzymes - drive various reactions ē in the cell
- proteins
- show remarkable degree of specificity
- they will only catalyse one particular type of reaction e.g Urease for urea hydrolysis
- Specific to a single substrate
- Some require presence of non-protein factor for completion of reaction called cofactor.
or prosthetic group (when tightly bound to enzyme)
or Coenzyme (when lightly bound to enzyme before activity)
e.g. Pyridoxyl phosphate (V. of B6)

Metallic ions - Mg^{++} reqd by certain enzymes

Mitochondria - intracellular
- Citric acid cycle enzymes and all enzymes assoc. ē oxidative processes

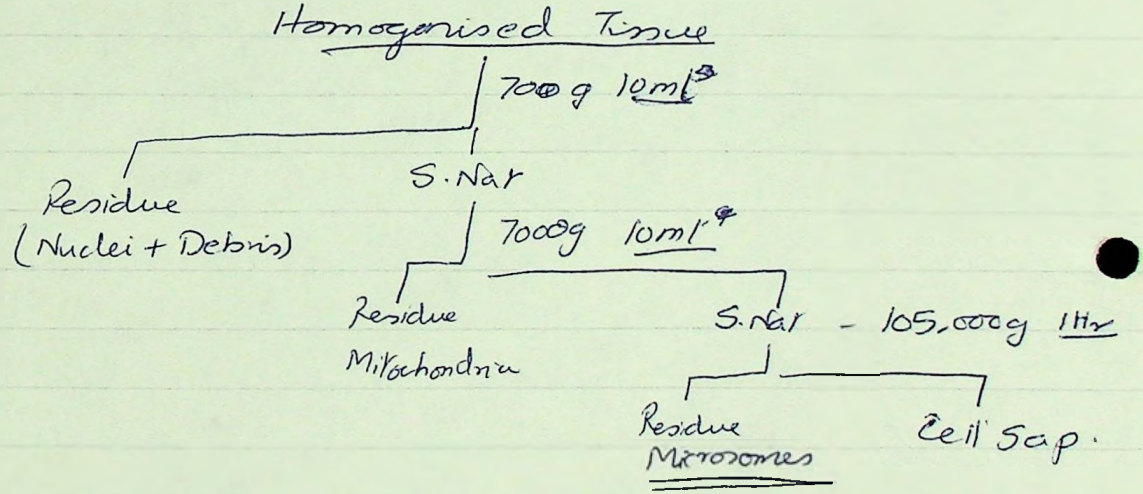
are all found in it.

- Electron transport chains.
- Endoplasmic Reticulum

complex system of membranes responsible for

i) biosynthetic processes concerned ē protein synthesis
ii) transport of products to sites of utilization and storage.
iii) Drug metabolising systems (enzymes) - or also called detoxicating enzymes

Lysozomes - packages of hydrolytic enzymes phosphatases, DNases, glucoronidases

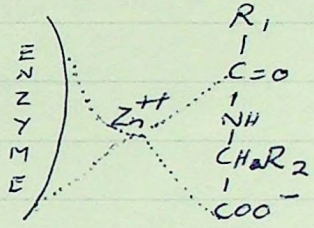


10/10/73

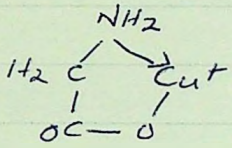
BIOCHEMISTRY - II

Enzyme Action

1. Substrate
2. Active site.
3. Specificity
4. Metalloenzymes



Chelate ring - e.g Copper with glycine



Ref: BMJ 1st May, 1971 p270

Inhibitors or enzyme inhibition

Various enzymes are sensitive to the presence of other materials or enzymes

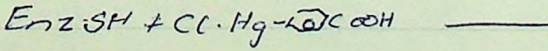
- Competitive] Inhibition p50-51 (Ref: Textbook)
- Non "]

↓ Effect reversed by adding more substrate.

e.g — Malonic acid inhibitor of succinic acid and succinates conversion to fumarates in citric acid cycle.

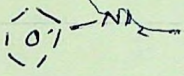
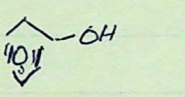
- Sulphanilamine competes ā PABA.
- Fluorocitric acid blocks citric acid cycle

Non-competitive inhibitors. (irreversible products formed



- Cu-Protein + $2CN^- \rightleftharpoons Cu(CN)_2$ + $Protein^-$
  Active enzyme — Inactive.
- nerve gases
- CN^-, EDTA — Non reversible products formed

FUNCTIONAL GROUPS in organic chemistry.

1. $R-NH_2$ Amino group
2. R-OH Hydroxyl,
   R- could be alkyl radical
3.  Amino
4.  Phenol
5. R-COOH Acetic and benzoic acids
6. $R-NH_2 \longrightarrow RNHCOCH_3$ Acetylation
   acetyl group
7. $R-NH_2 \longrightarrow R-NHCH_3 \longrightarrow R-N(CH_3)_2$ Alkylation
   Dimethyl amino R substance
8. $ROH \longrightarrow R.OCH_3$ Methoxylation

Processes of Detoxification

1. Phase I or non-synthetic reactions - oxidation, reduction, hydrolysis
   - tagging on of functional group

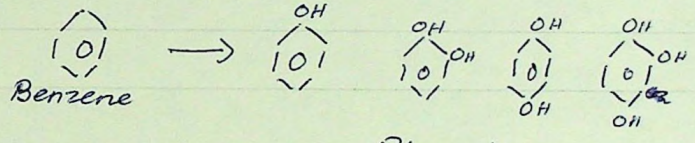
II - Phase II - reactions or synthetic reactions
- biosynthesis of a conjugate between a formed substance and some naturally occurring substance in the body usually a CHO or an amino acid

Phase I - Reactions

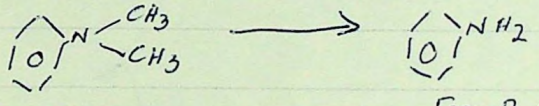
i) Oxidation

$$CH_3CH_2OH \xrightarrow[\text{Alcohol dehydrogenase}]{} CH_3CHO \longrightarrow CH_3COOH + CO_2$$

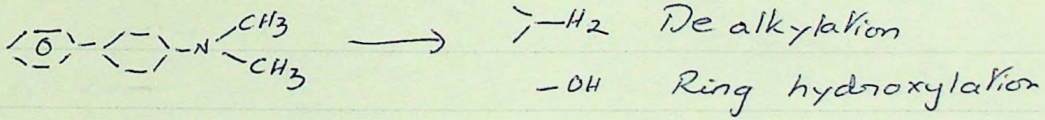
ii) Ring hydroxylation (Aromatic h.)

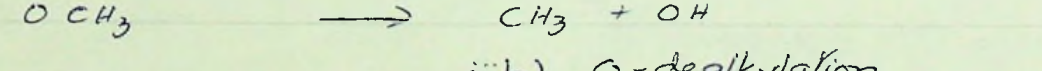


iii) Dealkylation



iiia) N-dealkylation





iiib) O-dealkylation

iv) Saturation

$RCH=CHR' \longrightarrow RCH_2-CH_2R'$

Saturation of a double bond.

$RNO_2 \longrightarrow RNH_2$

Nitro reduced to amines

$RNO_2 \rightarrow RNHOH$

Hydroxylamine derivative

$R\overset{H}{N}-OH$ - N Hydroxy derivative

v) Azo substances $RN{=}NR' \longrightarrow RNH_2 + R'NH_2$

Phase II Reactions (Synthetic)

i) Conjugation

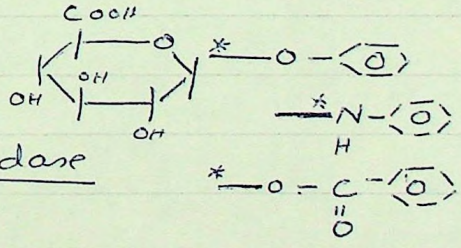
a) ∴ glucoronic acid $\longrightarrow$ glucoronide conjugate formed

Glucosiduronic acid

This reaction occurs only if foriegn substance has one of the following groups

- $-COOH$
- $-NH_2$
- $-OH$

Link up



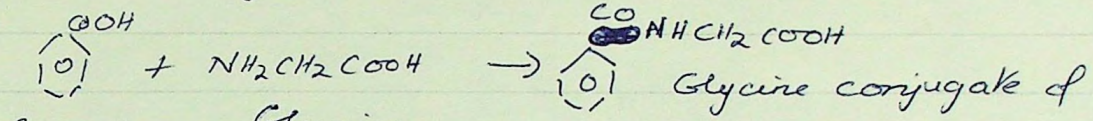
B-glucoronidase

Benedicts or Fehlings Test

False +ve if Urine contains Aspirin or other products in cough syrups like glucoronide

b) Glycine conjugation

occurs only if compound has —COOH



c) Sulphate (ester) formation - ē phenols and amines

d) Glutamine conjugation ē various tryptophan derivatives

e) Formation of Mercapturic acids from halogenated aromic hydrocarbons (Insecticides

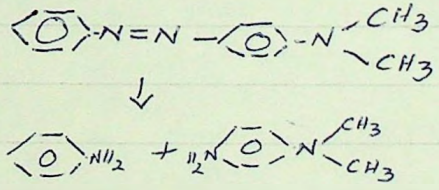
— N acetyl cystine derivatives.

F) Acetylation of amines

$RNH_2 \xrightarrow{\text{acetylation}} RNHCOCH_3$

$RNH_2 \xleftarrow{\text{deacetylation}} RNHCOCH_3$

Example



Dimethylamino azo benzene

DAB

- Butter yellow (azo dye)

Dealkylation

Hydroxylation

Conjugation ē glucoronic acid

Acetylation

Sulphate formation

15/10

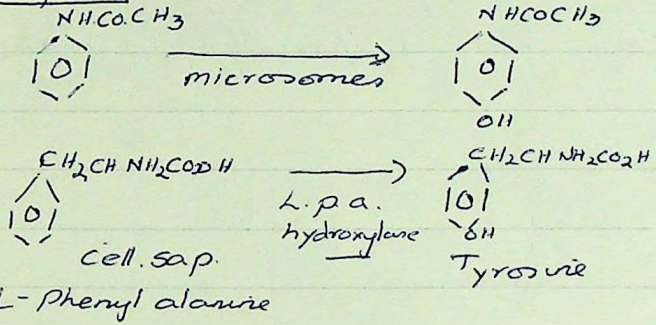
BIOCHEMISTRY – III

Factors involved in activity of detoxifying enzymes.

1. Specificity of enzyme to substrate
2. How closely does the foriegn material resemble the natural substrate?

Drug metabolising enzymes (Microsomal enzymes – they are normally associated with endoplasmic reticulum.

Example :



Oxidative enzymes – Mixed function oxidases

Reducing enzymes – Reductases

– $NADPH_2 + A \longrightarrow NADP + AH_2$

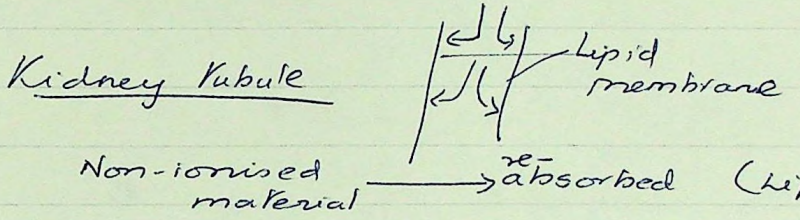
$AH_2 + O_2 \longrightarrow$ "Activated oxygen" — Cytochrome P-450

$Act.O_2 + Drug \longrightarrow Drug\text{-}OH + A$

– UDPGA gives G.A to foriegn compds in the process of detoxification. Enzyme involved is

UDP-Glucoronylase. (Found in the Liver, Kidney GIT and skin).

– absence of enzyme (neonatal jaundice) - bilirubin glucoronide not formed.



Lipid solubility, Ionization] important factors in distribution & excretion of foriegn substances

Acidic Drugs – Salicylates, Barbiturates

↓

Rapidly absorbed by stomach (non-ionised lipid soluble form)

Basic Drugs – Ephedrine

↓

Not absorbed rapidly because base is ionised and water soluble. It will however get reabsorbed in the intestines which have an alkaline medium.

Urine

Acidic urine – basic substances cleared quicker and v.v ∴ acidifying agent like NH_4Cl can be used.

Process	Agent	Tissue	Enzyme	Enzyme location
Glucoronide	UDP GA	Many + Liver	Glucuronyl transferase	Micr
Acetylation	Acetyl CoA	Many	Arylamine Acetylase	Super
Methylation	S. Adenosyl methionine	Many	Methyl transferase	Mic Sup.
Hippuric acid	Aroyl CoA	Liver Kidney	Glycine N-Acylase	Mitoch

---

Ref: Biochemistry of Foreign compounds
— Denis Park.

15/10

Chemical Structure and Biological Effect

CARCINOGENIC AGENTS
1. Chemical
2. Physical
3. Viral

Historical

1. Chimney sweeps ♂ cancer scrotum – observation started enquiry.

Known carcinogens

Urethane	89
2-Naphthylamine	143
DAB	225
Benzpyrene	252
Oestradiol	272.

① Wide range in Mol. wt.

② Structures

1. Polycyclic hydrocarbon.
2. Aromatic amines
3. Azo compounds
4. Biological alkylating agents

Polycyclic Hydrocarbons

a) 1,2:5,6 Dibenzanthracene
b) 3,4 Benzpyrene

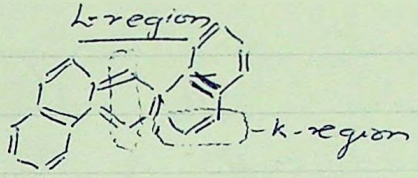
Isolated from cigarette tar.

Characteristics

1. Rigid molecule.
2. Flat.

] If these factors destroyed then carcinogenic effect lost.

3. Electron distribution



- important because distribution related to way in which the substance reacts on certain substances in the body

Aromatic Amines

1. Naphthalene
2. Anthracene
3. Biphenyl
4. Fluorene
5. Stilbene
6. Azobenzene

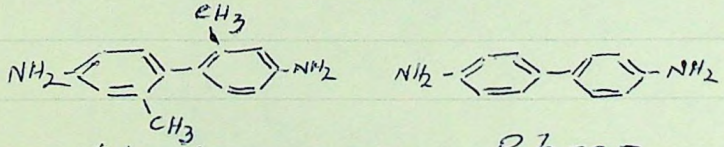
1-6 not carcinogenic

but when amino groups are tagged on they become carcinogenic

1. 2-naphthylamine (bladder carcinogen - dye industry)
2. Amino bi phenyl
3. Amino stilbene
4. Benzidine

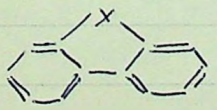
Factors of importance in carcinogenicity.

1. a) Amine group b) its position in the ring.
2. Planarity



Not planar not active — Planar Active

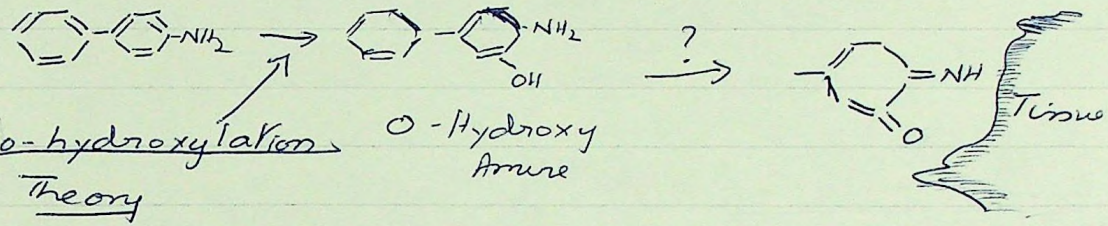
3. Analogues can vary in activity,



X = CH_2, S, O, NH ⟶ Depressed activity

THEORY

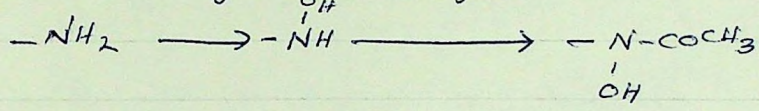
- These amines are thought to become carcinogenic in the body when they are hydroxylated ortho to the amine group.



I Ortho-hydroxylation Theory

O-Hydroxy Amine

II - N-Hydroxylation Theory :



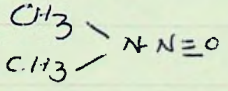
- Guinea pigs do not N-hydroxylate amines and therefore these compds show no carcinogenic effect on them.

Azo compounds

1. DAB (Butter yellow)

Biological alkylating agents

- Dimethy nitrosamine



- alkyl groups methylate nucleic acid

21/10/73 Modern Concepts in Occupational Health Practice — Prof Schilling

35 yr ago as IMO – Diagnosis, Treatment and Periodic Medical examination

Preventive Medicine
- Primary
  1. Environment Control
  2. Specific protection
- Secondary — Early Δ & Treatment
- Tertiary
  - Limiting disability
  - Rehabilitation

Industrial Medicine

1. Pre-employment examinations. Rejecting the less fit.
2. Treatment.
3. Secondary Monitoring
   Periodic examinations of persons employed in occupations with recognised hazards
4. Environmental Control.

Effect of War

1. Improvement of technique in selection of personnel.
2. Better machine design (development of ergonomics)
3. Development of rehabilitation unit.

} Armed Forces

4. Economic development – generally.

5. Training opportunities
6. Cost - effectiveness studies

Changing concepts

1. Pre-employment exam — not rejection but- A, R, and job placement
2. Treatment - centre as clue to problem and prevention
3. Secondary monitory

Methods of controlling recognising hazards

Periodic medical exam

Periodic Environmental - measurements

Uses of PME & PEM

1. Identify susceptible persons
2. Identify unsafe exposures
3. Determine threshold limit values — more in the work situation.
4. Evaluate methods of prevention

Sighting past 1. Primary observations

— new hazard may be discovered

Detection in industrial Toxicology

Suspected or Recognised risks

1. Toxicity testing
2. Information
3. Controls — Plant design, Hygiene standards, Monitoring.

Unsuspected or unrecognised risks.

Clinical observations – Occ Hlth serv
– Gen "

Records – Local
– National

Epidemiological enquiry.

6 Objectives

1. –

3/10 Legal Structure and Function Mr. N. Murray

Ref. Handout

Pleadings - documents by which party states his case

Proceedings

Letter before action (From solicitor of plaintiff)
Upto fortnight given
↓
Writ, (general nature of claim)
↓
Statement of claim
↓ Judgement in default
Summary judgement
Defence claim and reply.
↓
Summons for direction
↓
Trial
↓
costs (Taxing master)
↓
Execution
↓ Delivery.
possession
Sequestration
garnishee
charging.
receiver
attachment of earnings.

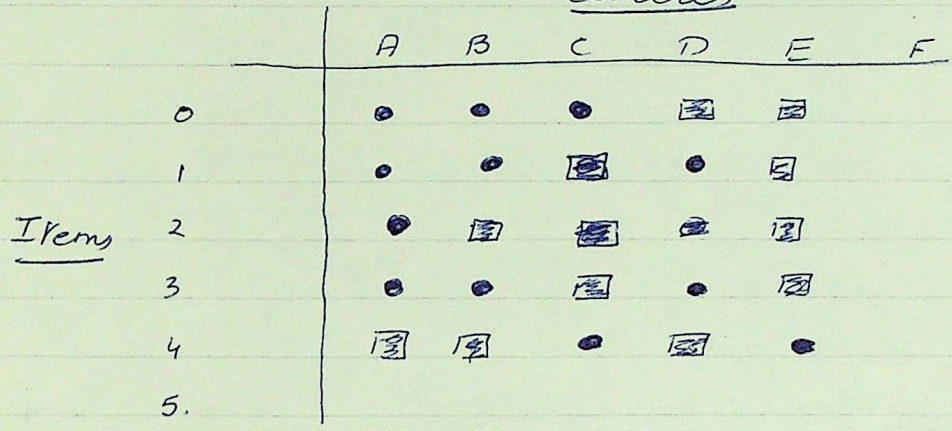
10/10/73 Manual information Handling systems Mr Jolley

I - Basic Principles

① Items

② Features

Information matrix



③ Data unit - •

④ Data field

⑤ Pattern — i) Exclusion A // E

↓ ii) Identicality 1 ≡ 3

Identity iii) Inclusion A ⊃ B ⊃ D

iv) Overlap B ⨝ C

Present feature unit •

Absent feature unit ▭ or ○

⑥ Number (quantity)

⑦ Relationship - within and between dimensions of a data field.

⑧ Edge of the field or network

⑨ Software and hardware.

II. What sort of questions can you ask the Data field for a) Administrative
b) Research

Many types

i) Feature quantity. FQ
ii) Feature identity FI
iii) Item quantity IQ
iv) Item identity II
v) Unit question U

Systems of Record

1. Item system (slices of field in one direction) or Item index e.g case sheets of a particular type of case.
2. Feature system

Available systems

1. Cards
2. Sheets
3. Microfilm
4. Tapes
5. Magnetic tape.

} Vehicles

Adaptability
Limitations
Connected / seperate

Manual data vehicles

① Cards — i) Blind filing cabinet or box.

Blind Filing System — ii) Cabinet & retaining device.

iii) Card wheel

Index

1. Straight index
2. Classified. : — by features

Cannot be changed easily

3. Tab cards
4. Coding —

② Visible filing system

i) Flat tray visible (cardex)

ii) Top-edge visible system (hanging cards)

iii) Vertical visible

③ Files

④ Ledgers —

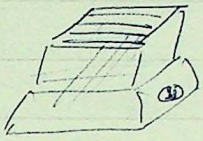
Punched Cards

1. Simultaneous search
2. Serial search

Simultaneous search — i) Moderately cheap.] Adv.

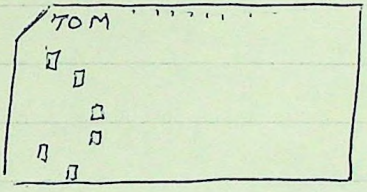
ii) Portable.]

Disadv - i) 4 holes per inch
- 'shivering chimney'



1. Edge notched 
2. Slotted notched card → 

3. 80-column cards — used in computers or counting machines



i) Code sheet - numerical or Alphabet

Connected data vehicles

4. Bi electric punch paper tape.
5. Microfilm coded.
6. Random access system

Feature System

1. Index cards - feature by feature. (Alumni)
   - on seperate cards

Advantages

1. Can be checked.
2. Search cards by adding feature by feature - and when mistake occurs only one card has to be rejected
3. Efficient in screening large populations (2000-3000)

Disadv 1. observation defect.
- Expectation effect can be simulated by moving the cards, column by column ↕ and seeing the effect.

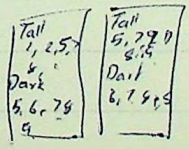
Expectation = Observations when sample random.

---

(2) - Matching Systems

(3) Matrices -
- Validity checks can be introduced into these Systems
- e.g. in multiple choice questions - two similar questions are put - same answer given means validity +.

(4) Dual dictionary Universe



Information handling

1. Primary data handling
2. Secondary info " – when figures as known are subjected to further calculation – square roots etc

Feature system

1. Information retrieval.

Disadv

1. Problams of grammar & syntax.
2. Object features

Technical expertise of knowledge required.

—

10/10

Arrangements of item index and features around the edge of the card

Object Matter
Coding

1. Single Alphabet A, B, C, D,
2. Diagraphs - alphabet pairs
   ↓
   To use this, every feature should be mutually exclusive. Overlap can produce some confusion.

A B C D E F G
AB
AC BC
AD BD CD
AE BE CE DE
AF BF CF DF EF
AG BG CG DG EG FG

3. Trigraphs, quadrigraphs etc.
4. Double subcoding
   - warning punches can be introduced
5. Coordinate subcode
   - problem of crossover is got over.
   - 'safety traded for capacity.

Subject Matter 'About' features

1. While coding keep eye open for
   i) Synonym - same meaning similar word
   ii) homonym - same world different meaning
   iii) Use of broader or narrower meaning.

—

Sources of information

1. Personnel record in Industry.
2. Technical librarian.
3. Statistician.

—

Ref: Data Study — World Univ. Library
J.L. Jolley

12/10/73

MEDICAL EXAMINATIONS

WHY? 1. Statutory Laws.
2. Company insists on it.

Pre placement
post sickness absence

Objectives

A. Fitness for work. — Performances - can he do the job
— Damage self. - will the work affect him (smoker r asbestos)
— Damage others - Food handlers

B. Fitness for pension.

C Detection of Early disease.
— For the benefit of the company.
— For the benefit of the individual.

D Improvement of Morale.
i) psychological effect on worker
ii) psychology of management

E - Detection of Environmental Problems r Occup. Hazards

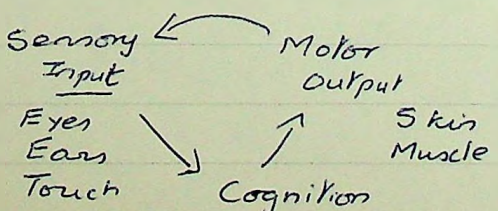
F - Health Education

G - Provision of Baselines

H - Research

I - Legal and administrative requirements

Technique



Support systems
CVS
RS
AS
NS

Tools

1. History — interview pt
   - questionaire
   - prev. medical reports or records
2. Phys. examn
3. Clin. Inv

Types of Med. Examn

1. Statutory medical exam.
2. Med. examn requested by i) Management
   ii) Patient.

Approaches

I Patient in relation to environment

The conventional approach

II Environmental in relation to pt — preventive medicine approach

Low yield of clinical disease

III - Environmental hazards in relation to Non-occup. disease.

e.g.

dusty jobs for chronic bronchitis

brewery job for alcoholic.

'high pressure' sales job for post MI pt.

IV Disability of patient related to Job performance.

e.g amputation of a lower limb
back injuries
CVA.

Clinical Surveillance

I – Asymptomatic persons – Screen.
- self admr questionaire
- Screening Test

II Symptomatic – 'clerk'
- examr by doctor

Questions

1. Did occupation cause trouble?
2. Are workmates similarly affected.
3. What can be done about it?

Screening Tests

1. Acceptable CDH
   Phenylketonuria
   Rhesus
   Bacteuria of pregnancy.

2. Insufficient evidence to justify – cancer — lung / breast / Cx

3. Some benefits to a few at high cost.
   T.B (U.K at least)
   Diabetes Mellitus (is R/ affecting outcomes)
   Hypertension (high drop out from R/)
   Iron deficiency – ? beneficial

Screening

"FOR"

- ↑ Δ of iceberg.
- unmask latent disease
- Earlier Rx ∴ ↑ health
- ↑ knowledge of disease

"AGAINST"

Ethics - What if no Rx exists
-- Is a 'trial' feasible

Scientific - Does earlier Δ alter natural history.

Financial How much is the community prepared to pay for one life

---

Validation of Screening Test

1. Simple
2. Acceptable
3. Cheap
4. Accurate.
5. Repeatability. in / between subject / observer.
6. Sensitivity
7. Specificity

Ref. 'Screening in Health & disease' Nuffield Inst.

Discussions

① British Airways

Formal

Pre-employment

- Full (M.O)
- Hygiene (nurse)
- Screen (questionaire)

Periodic

Pilot

Heavy ground vehicle drivers

. Overseas expatriate staff.

. Executives

Irregular

Return to work

Frequent sickness absence

Rehab

Informal

Consultation

Surgery

own

Recommendation

12/10/73

TRADE UNIONS

History - Guilds - Apothecaries, Fishmongers (Assoc" of managers)

Industrial revolution ⟶ Exploitation of Labour

↓

Start of Trade union - earliest in

Textile mills (Lancashire)

Local, & parochial

(lack of communication with other unions)

↓

Spinners, Potters, Miners

↓

Union - considered Treason & Sedition 1799 - 1825

↓

Tom Payne (Concept of Personal Liberty)

'Jacobean'

↓

1825 - Laws repealed and Trade unions allowed to grow

Bishops Weed (Scotland) Cut of top - grows more roots

Present day

Craft union	AMEW [Amalgated Union of Eng. workers]	Unions
Industrial	NUM (Nat. Union of Miners)	1. Completely autonomous
	NACODS (	2. Elected Executive
	NUR (Rails)	3. G.S (salaried) - spokesman of Union
	ASLEF (Loco engineers & Firemen)	
General	TGWU	4. Organisation.
White Collars	ASTMS	National offices
		Regional "
		District "
		Local "
		Branch G.S.

'Shop steward' is not a necessary part of the T.U.

Printing works – Chapel, Father of a chapel

Shop Steward – Head of a group of workers on the factory floor. The workers may or may not belong to the same union.

Organisation

T.U

Executive
G.S
↓
Nat. offices
↓
Regional office
↓
District "
↓
Local offices
↓
Branch G.S

ICFTU – International Confed of Free Trade Unions
WFTU – World Fed. Trade unions
Also – International federation of specific workers

TUC
↑ Gen Council
↑
Federation of Trade Union

CONFED (Confed. Ship. + Eng. Unions
PKTF (Printed + Kindred Trade fed)
ISTC (Iron + Steel Trades Confed)

Federation (Secretaries of local T.C)

Trades Council (Secretary of Local T.U's)

1868 TUC – Trades Union Congress – represents the voice of Trade Unionism. (collective conscience of TU's)

1968 – TUC-Centenary Institute (LSHTM)

↓

Elected General Council

↓

Consulted by Local Authority, Govt, Employers.

↙

on
Economic policy.
National "
International "

Issues
- Wages
- Hours of Work
- Compensation
- Quality of Life
  - Health
  - Environment.

TUC = 125 unions → 10 million members (40% of Total Work Force in country)

1st Med. officer – "Thomas Legge" + 1 " (unregistered Union

15/10/73 Design of Occupational Health Departments. Dr. C. A. Reys

Principles

1. Build up existing poor facilities to maximum
   - to project 'need'
2. Use of statistical data to show increasing commitment.
3. Approach and pressurise all sides involved in the decision

---

4. Analyse work of department - Lines of flow, needs, sectioning,
5. Visit other similar departments
   i) List of all the 'do nots' at least.
   ii) New or efficient ideas.
6. List all needs
   - esp back up services
   - new developments

Floor space
- Floor I & II
- Splitting of function by floor

7. Give measurements if possible to architect.
8. Siting of department - centrality
9. Needs of every person involved in working of department should be taken into account.

When Architects plan being drawn:

1. Elevation - Surrounding buildings.
2. Floors - Split function. Xray, Casualty, blood-bank

3. Windows - Directions, sunlight.
4. Doors., lighting, heating, electricity.

Final Plan

Interior: 1. Carpetting or Floor matting.
2. Colour.
3. Cubicles?
4. Changing rooms.
5. Cleaners room or cupboard.
6. Lavatories.
7. Archives rooms.
8. Common rooms for staff.
9. Decor - Art - aesthetics

15/10 — Angina Pectoris — ILEA T.V 1.15 PM

Manifn
- Angina Pectoris
- Coronary insufficiency
- Myocardial infarction
- Coronary Thrombosis
- Sudden Death

IHD - Background
- Cholesterol
- Uric acid
- Triglycerides.
- Blood counts & Hb.

Management

Diagnosis –
- Normal E.C
- Normal Cor. arteriogram
- Recent cardiac infn.
- Anemia thyrotoxicosis, mitral stenosis
- Primary myocardial disease

Correction of
- Cigarette smoking
- Alcohol.
- Overweight
- hypertension.
- Metabolic disorder

Treatment
- of LV dysf.
- of dysrhythmia.
- Period of rest
- graded exercise

Drugs — Glyceryl Trinitrat
Long acting nitrates
β adrenergic blockad
? ~~Propranediolol~~, propranalol
Anticoagulants

Surgery — venous grafts
Electrical stimulr of carotid sinus C-sneves
Resection of infarcts and aneurysm.

DIH Questions

1972-73

1. Diff. Δ of transient loss of consciousness
2. Occupation hazards in hospital laboratories
3. Codes of Practice – Meaning & importance
4. Identfn & R/ of a senior manager ℰ drinking problem
5. Restrictions on employment of diabetics
6. Chemical constituents of epoxy resins and precaution for safe handling.
7. Immune mechanisms in occupational disease.
8. Ergonomic features in air crew workspace & why?
9. Discuss increase in claims for Nat. Ins benefits
10. Occupation hazards in the cotton industry.
11. Tumors of urinary tract in relation to occupation.
12. Discuss investigation of pt ℰ weils (amer systemic diseases)
13. Occupational exposure to graphite, phenol, paraquat.
14. Phthalic anhydride & enzyme washing powder
15. Radiological changes in bone as result of work.
16. Assessment of fitness to drive lorry drivers aged 55 ℰ A.T.
17. Collection of sickness absence data in work force of 5000
18. OHS and health and safety of public.
19. Role of R/ in OHS.
20. Occupational causes of bronchospasm
21. Animal diseases and occupation of man
22. Constituents of diesel exhaust fume – How to determine whether diesel powered fork lift truck is suitable for use

Short Notes

dB(A)
Damage risk criteria
impact noise
narrow band noise
temporary threshold shift

Statistics

Standard deviation
Correlation coefficient
Age standardization
Cohort Mortality studies
Confidence limits
Normal distribution
Stratified sampling
Median
regression coefficient

22. Path & Clin features of Chr benzene poisoning
Precautions in manf & transportation.

23. Immediate Rx and management of
acute M.I.

24. Aetiology & diff Δ of miliary mottling on
the xray.

25 Assess medically civil engineers and
their families for services abroad.
— principles & advice.

26 Personal factors which may
influence accidents at work

15/10

Ergonomics

1. Anatomical measurements — racial and stature differences must be taken into account
2. Stereotypes — cultural and country differences in movements of switches etc.
   Factors involved — ? Habit
   Cultural influence
   Cerebral dominance.
3. Anthropometry — measurements of ranges in movement, O_2 expenditure at work (sensitive for active work — but difficult with sedentary work)

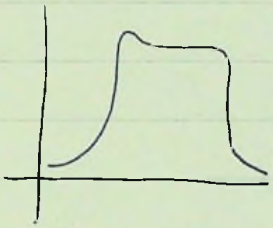
Poor ergonomics. — Indication of need for human work factor studies:
1. High labour turnover
2. Sickness absence
3. Under achievement
4. Premium payments

4. Experimental design

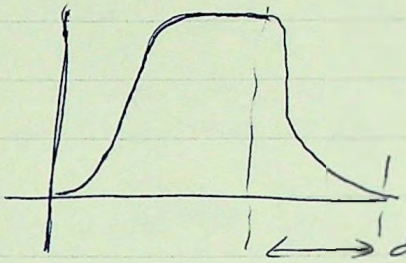
5. Repeatable physical and psychological responses or reactions

6. Feedback.

Light work



Heavy Work



Ref: Ergonomics Research . Soc. Journal (U.K)
Human Factors (U.S.A)

15/10/73

Impact of Local Government Reform

Arguments

A- SERVICE

1. Easier administrative set up.
2. Innovatory.
   e.g Comprehensive reorganisation of secondary schools
   Preventive child care
   Saturation 'policing'
3. Better services can be provided.
4. Sensitive to local needs

—

B- POLITICAL

1. As political education (Philosophy of John Stuart Mill)
2. community self-help.
3. Resists excessive centralization or 'caralier' attitudes.
4. Can challenge policy of Central Government.

—

ADMINISTRATIVE SET-UP

Local Authorities — County Boroughs (Large cities)
— Counties (towns & rural parts)

Counties - Social service / Education
Districts - Housing.
Refuse collection

Districts
Parish (Urban District)
Rural District.
Non County Borough.

Problems with set up

1. Too many small local authorities
2. Seperated rural from urban districts

Royal Commission on Local Govt in Britain

—

New Reform

1. Universal two-tier system (47) Counties
   ↓ (333) District ≤ Parishes
2. Areas embracing both rural and urban parts
3. Functions
   Counties - Education, Social services etc
   District - Housing, refuse collection etc

Metropolitan Areas

London, Manchester, Liverpool, Birmingham, Leeds, Sheffield, Newcastle.

Met. counties
↓
Met. Districts (will have more power since population +++
↓
will take over education and social services

4. Overall effect
   ↓
   fewer & larger authorities

—

IMPACT

1. Finances - equalising effect.
2. Stronger professionalism among LA's
3. Politically stronger LA.

Problems

1. Increasing remoteness
2. Two-tier system can produce problems
   - overlapping jurisdiction
   e.g. Homeless family / Housing (District
   - Social Services (County)
3. Metropolitan boundaries too tight.
4. NHS not coordinated with reformed administration.

↓

Arguments put forth.

1. Med. profession did not want local party politics to interfere c work.
2. Interference with clinical discretion.

—

Ref: NHS Reorganisation CMND 5055 . 1972
Local Govt in England CMND 4584. 1971
Royal Commision Report " CMND 4040 1969

Case Demonstration-1

18/10 — **Leucodermia in the Chemical Industry** — Dr Cooke

Aetiology – i) Constitutional Genetically determined constitutional factor
ii) Chemical toxins

Non-occup^n 2. Leprosy. vitiligo.
3. Post-inflammatory – impetigo, eczema, burns.

Occupational. 1. **Rubber gloves** – tightly fitting (hydroquinones)
Rubber, elastic, condoms (close contact c skin
2. Neoprene adhesives

Case History

Mr Flower
41
Occupation: Coach trimmers – Pull wet adhesive trimming to cover seat
First symptom – 1961 reported to (Works Hosp)
Red spots, itching – (esp when warm) – no frank dermatitis
– months later (?12) it became white patches. – never any weeping
– areas affected – in contact c adhesive solution dorsum of fingers., few marks on the chest.
– Start of work – 'intoxicating' effect of fumes – feeling of nausea, dizziness; get used to it after some time: (hot unventilated atmosphere, c fumes ++)

- change of adhesives and solvents - produced less symptoms - but often continued to occur
- inability to wear rubber gloves ∵ nature of job.

Discussion

Chemical - P-tertiary butyl phenol
quite a few other similar chemicals

Slides ① Constitutional ← mother had similar history on fingers
② - Contact - due to plastic shoes.
③ Extensive lesions - finger
hand & arm - sleeve rolled up
chest - shirt open ∵ of heat in the room

Effects due to 1. Contact
2. Inhalation (reported by Japs & Russians)

22/10 Industrial Hygiene Mr Sanderson

Defn - Science dealing with the recognition, evaluation and control of factors of stress arising in or out of the place of work which may affect the health of the workers and or the community.

RECOGNITION of HAZARDS

1. Chemicals
   - Dust
   - Vapours
   - Gases
   - Mist - Chr. plating
   - Fogs
   - Fumes

2. Physical
   - Noise
   - Light
   - Heat/Cold
   - Ionising radiations
   - Microwaves
   - Lasers
   - UV rays
   - Electro-magnetic radiation

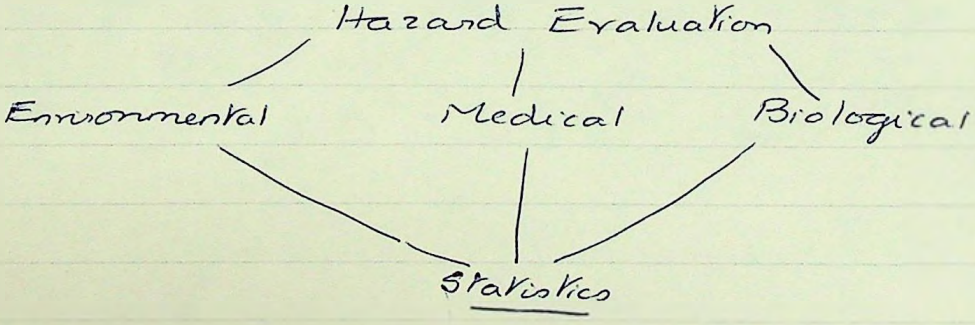
3 Biological
   - Mites — Farmers lung
   - Insects — Enzyme washing Powder
   - Yeast — Anthrax
   - Spores of pathogenic fungi

4. Ergonomics: Actual work situation

EVALUATION of HAZARD

1. Medical studies (Doctor or nurse colleagues)
2. Biological studies – biochemical – blood leads
   – histo pathology etc – serum studies
   (Doctors, toxicologist, hygienist)
3. Environmental studies
   (Hygienist)

Information from 1, 2, 3 should be fed into a bio-statistics department to get a proper estimate of the overall hazard.



Sampling

Air-
1. Air sampling. – sample of air from near worker's environment. (Single reading - not so accurate)
2. Personal samples

3. Precision Sound level meters

4. Temperature, humidity, Air movt.

CONTROL - Basic principles

1. Substitution: -

non toxic for toxic chalk for talc.

wet handling of dust instead of dry handling.

welding instead of riveting

Ca silicate instead of Asbestos.

Carborundum instead of free-crystalline silica

Steel blasting instead of sand blasting

Mechanical guages instead of mercury guages

2. Specification:

at design state
- maximum permissible levels.
- limit concentration of toxic substances in materials

e.g 1% m,m ortho cresol phosphate in a mixture of isomers is relatively non toxic

- α naphthylamine in anti-oxidants in the rubber industry

3. Segregation by - Time
Distance
Enclosure

4. Local exhaust extraction - applicable when hazard at a point source

5. Dilution ventilation - not applicable to point

Sources of release of contaminants
- not applicable to toxic materials
- not in cases when large volume of air is reqd for dilution of contaminant to permissible levels

6. House keeping

7. Education of the Working - current awareness

8. Medical Surveillance, exam, control

9. Personal Protection

Environmental Standards

TLV - Represent airborne concentration of toxic substances under which we believe most workers may be exposed for an industrial life time with no adverse effects.
Based on animal expts, human expts but mostly on human experience

- Some are so toxic that a ceiling value has to be applied e.g Nitrogen di oxide
Benzene 25 parts/million
Mn 5mgm/

19/10

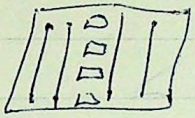
Project-D

Ref: 1. Wilsons Report. 1965 HMSO
2. Ann Occup. Hyg. Vol 9 pp 149-163.

- Some have a 'skin irritation' value.

Examples

1. Lighting should be along long axis of room.
of table



2. Not too much glass
3. Matt floor - not polished
4. Dull neutral colours on wall - buff, grey
5. Not dull, or dark coloured table tops

Housekeeping - in a Pb paint factory.

Exhaust ventilation - imp to check where air inlet for fresh air is fixed.

Welding - Zn fumes from sheet painted ones
→ Metal fume fever or 'zinc chills'
- Local exhaust system better than Personal
- Use of Argon gas sheath adds to hazard protection.

CO_2 shield

CO_2
ozone
(Manganese)
Fume

Argon shield

ozone
(Mangane)
Fume.

- To minimise ozone effect - general ventilation should also be good

Home environment

i) Medicines at home.

ii) Gardening chemicals.

iii) Thermometer 'breaking'

Mode of entry of toxic materials

Inhalation

Ingestion

Absorption thru skin

Labelling.

Operating Block Studies

Evaluation of operator exposure

Evaluation of atmospheric losses

Prediction of Ground level concentrations

Implications of High Court Decisions 1972

Supplier

Responsibility to inform users about hazards

Cutting oil (non-refined)

1. Dermatitis
2. Scrotal cancer
3. Cancers of digestive + resp tract

Trends in use of cutting fluid

↓

St. oils

Emulsion

↓

Synthetics

RV

By Helium dilution method

Dr Sharma

$V_1 = 1.8$

$C_1 = 10$

$V_2 = 1.8 + FRC$

$C_2 = 6.6$

$V_1 C_1 = V_2 C_2$

$V_2 = \frac{V_1 C_1}{C_2} = \frac{1.8 \times 10}{6.6} = 3$

$FRC = 3 - 1.8$

$= 1.2$ litres

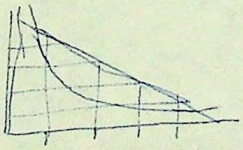
$ERV = 650$ ccs

$RV = 1.2 - .65$

$= 550$ ccs

Transfer Factor by (Helium & CO) gas exchange method

$T_L = m^2/mm/mm\ of\ Hg$



25/10

PROJECT E

1. Who is Med. officer responsible to now?
   Was he in a better position previously?
   Answerable to single person vs board.

2. Should voluntary or optional M.E available previously be dropped?

3. What statistics could be used to show whether (2) was useful or beneficial to company? workers?
   - attendance rate — type of problem
   - sickness absence.

ARMY —	P	U	L	H	E	E	M	S	M r S
	Physical Capacity	Upper limbs	Lower limbs	Hearing	Rt	Lt	Mental Capacity	Mental Stability	Special tests

1 – Superman
↓
8 out

PES =		
Pulheems	FE	Forward Areas (Full employment) Everywhere
Employment	FT	" (Temperate) (Psoriasis)
Standard	BE	Base operations Everywhere
	BT	" (Temperate)
	LE	Lines of Communication everywhere
	LT	Lines of communication (Temperate)

4. Why change in the policy?
5. Whether £3000 p.a is a sensible point of division
   - arbitrary?
   - whether age or nature of job better criteria?
6. What will be done with the information or results of the compulsory M.E?
   - 'Package deal' including rehab, R, , change of job should be offered.

(2)

1. Equalise expenditure to which level?
2. If reduction decided upon - how?
3. How figures arrived at? Same accounting system
4. How does one cost a service?
5. Centralised cooking vs local cooking.

Ref: i) Journal of Occup Med Vol 13 - 1971 5th May

ii) Trans of Royal Soc of occup Med Jan 1969

25/10 Sickness Absence - Recording Dr. P. L. Taylor

(Handouts)

25/10

Occupational Carcinogenesis:

Relative estimates of Causes of Human Cancer

Radiation including U.V light — Less than 5%
Viruses - Burkitts & leukaemia — less than 5%
Chemical Agents — 90%

i) Carcinogenesis in Clinical Population (Walter. J. Burdette)

Endocrine 32 — Tobacco - 10 — Chemical carcinogen - 7
Irradiation - 20 — Virus 7

ii) Dose of chemicals that can produce cancer

100 mgm ⟶ 1 µgm

iii) Average Latent periods

Skin — Solar radiation 15-40
X-radiation 1-12

Lung — Asbestos 15-21
Ionising radiation 7-50

Bladder - Aromatic amines - 2-40

iv) Overall incidence not high.

Skin — Arsenic - Med 3-40
Occup 4-46

Tar - 1-50
Creosote oil 15-40
Mineral oil - 4-75
Crude Paraffin oil - 3-35

v) Agents Carcinogenic to man

Site	Causative Agent
Lung	Cigarette smoke, Asbestos, Mustard Gas
Mouth	Tobacco baked nuts
Lung	
Bladder	
Stomach	

vi) Other Factors — Cohort Studies

a) Social Class - std. of living

History

Sir Percival Pott - Chimney sweeps & scrotal cancer

Mule spinners cancer - Skin & scrotum

① Skin Cancers - Coal Tar & Pitch

- Japanese workers induced skin-cancer on rats - Tar Pitch

② Aromatic amines: Bladder Cancers

1. Chemical works
2. Dyestuff makers
3. Rubber works
4. Cable works
- Laboratories (Test reagents)
- Hospital (clinistix)
- A Rodenticide (ANTU)
- Water Testing (Chlorine content)
- Schools (Chemical expts)

29/10

Toxicology - Industrial Solvents

Ref: Industrial solvents" - Ethyl Browning

Defn: Liquids which dissolve certain other chemicals without in any way changing the characteristics of the chemical.

Use a) Chemical — Textile — Colour Printing
Oil refining — Leather — Perfumes
Paint, Laque — Rubber — Pharmaceutical
Pesticide — Shoe — Polishers

b) as Refrigerants - chloro fluoro HCs

c) as Degreasers - Engineering
Dry cleaning
Extraction of oils, fats

d) in chemical synthesis or intermediates in chemical industry.

Properties 1. Narcotic hence toxic
2. Damage skin - repeated contact esp degreasers
3. Organic chemicals
4. Flammable and explosive Flammability $\frac{1}{2}$ Toxicity
5. All are volatile (depends on vap pr & temp)

Physiological action: i) Dry skin - dermatitis - eczema.
- some form - acne type reaction
- some primary reaction - chem burns

Ref: "A Study of Skin absorption of Ethyl benzene in Man" - Brit. J. Industr Med. 1967, 24, 330

Surface of absorption : is lung = Kennis Court

Routes of absorption

1. Inhalation - effect on brain ——— e.g NH_3 - quick effect on nose and eye
2. Ingestion - detoxication in liver
3. Skin contact

Cl_2 → bronchitis

Phosphene - pulm. edema

- Effects on brain
- Effects on nerve - peripheral neuritis : TCE
- Effects on heart - benzene, chlorinated & fluorinated HC - arrest / arrhythmia

In general - Removal from exposure → Recovery

→ i) Sensitization

ii) Alarm reaction → Adrenaline ↑↑ → sensitization to HC.
- Sudden death or ventr. fibrillation

iii) Asthma inhalants - abuse - in cyanotic stage sensitization to solvents in inhalant
- death due to gasoline fumes → cardiac arrest

Skin - malpighian cells & ionic barrier

Ingestion < Suicide / gross carelessness → Liver - (detoxication) ↓ damage (CCl_4) or failure

TEL & TML are not toxic → but metabolites Tri EL and Tri ML are toxic

1/11

Industrial Solvents - II

Classification 'A'

Water

Petroleum hydrocarbons - gasoline or petrol (paraffins cyclopraffins, aromatics)
Petroleum naphtha (chiefly paraffinic)
Kerosene
white spirit
benzene (distinguish between benzene, benzine, benzol, benzde)

Aromatic Hydrocarbons - benzene
toluene
xylene
coal tar solvent naphtha
ethyl benzene
cumene
styrene

'B'

Halogenated hydrocarbons.

Chlorinated - mono chloro methane (methyl chloride)
- 1:2 dichloro ethane
1:1 dichloroethane
1:1:2 trichloroethane
1:1:1 trichloroethane

Chlorfluorinated Freons (US)
'Arctone'

'C'

Cyclic hydrocarbons - cyclohexane

Alcohols methanol, ethanol, propanol

butanols, pentanols, hexanols
allyl alcohol, ethylene chlorohydrin

Ketones — acetone
methylethyl ketone
methyl iso butyl ketone — methyl butyl ketone → polyneuropathy

'D'

Acetals + aldehydes — formaldehyde, acetaldehyde
paraldehyde, furfural

Esters — ethyl acetate, methyl a, butyl a
the lactates the formates

Ethers — diethyl ether (ether)

Glycols — ethylene glycol
polyethylene glycols (peg + meths → emergency ky for phenol burns

Miscellaneous — CS_2
dimethyl sulpare
dimethy sulphoxide → delayed pulm. oedema
used for ky of collagen diseases
expensive, first class solvent

—

BENZENE

TLV ACGIH 1971 (U.S) 25 ppm 'c' 'skin' (80 mgm/m³)
U.K TLV / 1970 "

Amer. Industrial Hygiene Assoc Hygiene guide 1970 — Short exposure Tolerance 100 ppm Ceiling value 25 ppm.

- Measurement i) Smell - Used for above TLV
  ii) Casella Test
  iii) Gas liquid chromatography - GLC

Solvents & carcinogenicity

1. Certain solvents accelerate the activity of those polynuclear aromatic hc which are carcinogenic to animal.
   n-docosane
   do-decyl benzene] long chain structure

- Non accelerators include - benzene. Toluene. Decalin

Marrow - Depressant Drugs & Chemicals
British Journal of Hosp Med - Nov 1971 Vol 6 No 5 p 595

Methanol - Blindness, mental degeneration neuritis

Trichlorethylene arrhythmias, converted to phosgene
? liver damage

CCl_4 Liver damage

CS_2 Parkinsonism & atherosclerosis

Glomerulonephritis or Chronic nephritis — recently reported
& prolonged exposure to hydrocarbon solvents

29/10 Lung Function Tests Dr. M.L. Thomson

Structure & Function of Lung Tissue Film

Types of defect 1. obstructive

2. Restrictive – Fibrosis (Diffuse pulmonary)

Gough section. i) Normal lung.

ii) Asbestosis small, shrunken

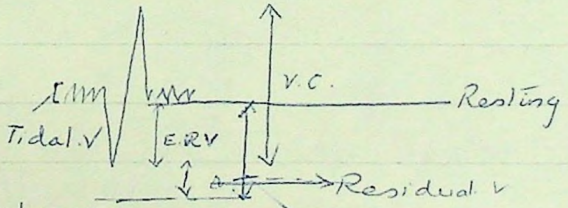
iii) Coalworkers pneumoconiosis

Pulmonary Function Tests

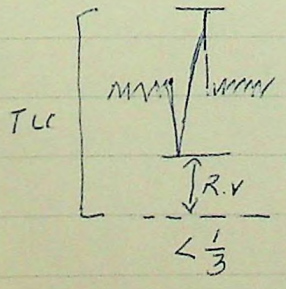
STATIC VOLUMES:

1. Vital capacity
2. Expiratory reserve volume
3. Residual volume

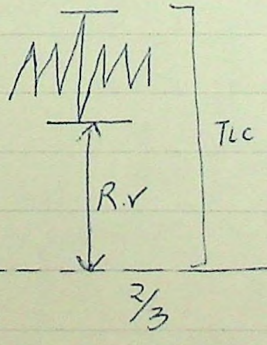
Spirometer



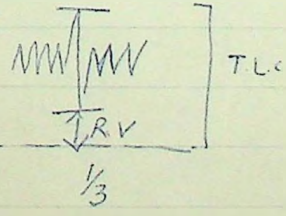
Normal



Obstructive



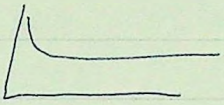
Restricted
Diffuse Pulm. fibrosis



Index of Hyperventilation = $\frac{RV}{TLC}$

All but RV are obtained by use of spirometers

Residual Volume - Measurement: use of inert gas Helium
- Process of dilution
- Helium breathed in closed circuit and conc^n measured till it becomes constant



DYNAMIC VOLUMES

1. Force expiratory volume $FEV_{1\,sec}$
2. $\frac{FEV1}{FVC} = 75\%$ Obstructed ↓
   Restricted - Normal

3. Diffusing capacity - Transfer factor - ability of the lining layer of the lung to allow diffusion of gases
   Method of measurement - Single breath C.O 0.2%
   hold for 10 secs and breath out.
   - Conc^n measured in expired air

4. Peak flow rate - maximum flow rate achieved during a maximum Puff. (Peak flow meter)

Processes where exposure ↑ i) Manufacture
ii) Packing
iii) Gen housekeeping pure

Occup. tumours of the bladder

1. Incidence figures decrease with distance from source or danger — Proces +++ / Dept ++ / Factory + / Country +
2. Hazard - Dust
   - Vapour
   - Skin contact

Occup. risks cannot be always be detected by studies of national or regional statistics

---

Asbestos & Cancer

i) Type — Crysolite (white) — Bronchial Cancer
Crocidolite (blue) — Mesothelioma & Bronchial Cancer
Amosite (brown)

ii) +Smoking increases greatly the risk.

Talc workers - Hazard of cancer

Nasopharyngeal Cancer & Wood workers
Wood workers vs all other occupations
$-x^2 - 11.98$ and $p < 0.001$

Charles C Thomas
Publisher

Ref: i) Chemical Carcinogenesis & Cancers
Hueper & Conway ~~& Fallon~~

ii) British Med. Bulletin Vol 20 No 2 May 1964

iii) B. M.B Vol 14 No 2 May 1958

29/10

PROJECT-'F'

Information Available

① Medical History

Man
Age: 42
No previous significant history.

H/o Sudden loss of consciousness at place of work at night. Duration of episode not known. Involuntary micturition.

Fork lift truck stationary?

No concrete information from patient.
No witnesses to incident

Contemporary examination unproductive.

② Occupational History

Fork lift Truck driver
12 years service
Type of work: Stacking of pallets in a steel tube store (weighing several tons)

- No pre-employment medical
- No previous data available in factory records (itself only 5 years

③ Enquiry: Re: effect on employability.
Enquiries: Patients elder brothers - (Convenor of shop stewards in the plant)

COURSE OF ACTION:

1. Explain to the brother
   i) what are the possibilities regarding the diagnosis of the medical condition

2) The position of the law re: the incident.
3) The importance of getting his brother off the job till further investigations are completed.
- stress on danger to others as well as to himself.

2. Referral of patient to
i) Specialist and further investigations — xray skull / E.E.G
? ii) Honorary Advisory Medical Panel on Epilepsy of the Department of Environment — if the attack is thought to be epilepsy
→

3. Inform i) Management
ii) Licensing authority.

4. Transfer patient to i) a safer job ?
ii) regular medical supervision.
↓
depends upon finding and specialist opinion as to whether or not attacks are likely to recur.

5. Return to job if no attack after 3 years

(a) The Diff Δ of a single episode of sudden loss of consciousness and involuntary micturition at night, with no other signs or important information in the history. - in a man aged 42.

Organic disease : Epilepsy (symptomatic) due to

Cardiac	Cerebral	Tumour.
Chemical		vasc. disease
Metabolic		chemical toxin
Intoxication		degeneration
		Trauma + infn

ruled out

- Fork lift stationary - may mean pt had an 'aura'

- Chemical hazard in steel industry - solvents? known to cause such episode - but single attack & no previous or prsent history of exposure — unlikely.

b) Referral to a specialist — i) Electro encephalogram.
ii) Xray skull

Question of whether such patients should subsequently be allowed to resume driving will depend upon the findings and on specialist opinion as to whether or not attacks are likely to recur.

—

c) Position of the Law p 56 1 — 4.

Booklet: 'Medical aspects of fitness to drive'
by Med. Commission on Accident prevention.

Disorders of Nervous system

"Any defect or disease process which affects temporarily or permanently those functions of the nervous system which are concerned with perception, judgement or alertness of the driver or his ability to carry out the movements necessary to control his vehicle may impair his fitness to drive" (p 24)

p24

"Paroxysmal disturbances which lead to impairment of consciousness are absolute contra-indication except in special circumstances

Also p 28, p 29

Chapter on Epilepsy

- New Regulations relating to 'Epileptic' drivers (a)-(c)

- Advisory panel - p21
- Epilepsy of late onset - p22
- patient ć single attack - p23

EMAS Notes p2
Conditions likely to be bar to employment
(2) Epilepsy

(d) The driver must be taken of his work.
i) possible Δ
ii) hazardous job - both to himself
\ safety of others

- Wait for specialist opinion
- If Δ give safe job like watchman or store-keeper
- Keep under regular medical supervision.

- ? prepare people working in same area - about what to do in case of an attack
- If attack occurs start RJ.

- If not attack for 3 yrs - can restart driving.

(e) Med. exam^n - of all Fork lift drivers instituted
- also other vulnerable groups.

f) Brothers cooperation obtained right through. Good public relations. Danger to workers to be stressed

Clinical Diff Δ
- Epileptiform
- Trauma
- CVA
- Alcohol
- Diabetes

- Importance of having medical personnel present or available on call for such emergencies.

- Arrangement ∓ G.P?

- Get patient to Hospital — Plant or General Hosp — For observation atleast = 24 Hrs.

- Whether GP, Firstaider or Nurse will be of same use in such a situation.

- Male nurses - Toughness of environment -
  - drunken employees, most of heavy patient
  - isolated med. dept - esp at night.

- Medical Requirements for Fork lift operators (E.M.A.S)

- Pre-employment medicals ?
- How often examinations repeated? and when?

- Meeting ∓ brother:
  Why has he come? role of nearest kin?
  Convenor of shop steward?
  'incident' talking point for some other problem — environmental
  - machine - fork lift - needs repair
  - human factor
  - past history of pts illness.

How much to tell him? / also depends on consent of patient.
depends on why he has come.'
- Is the medical office right place for this discussion
-

PROJECT - 'F'

CASE ① Medical History

Man

Age: 42 years

No previous history: ?

H/o Loss of consciousness

involuntary micturition

Duration of episode: ?

Time: Night

② Occupational History

Fork Lift Truck Driver

12 years Service

Place of work: Steel Tube store

Pallets - weighing several tons

Height stacked - 25 ft

No concrete information from pt. No witnesses.

Contemporary examination - unproductive.

③ O.H.S Record

1. No Pre-employment Medical.
2. No previous data available in factory records. (Only 5 yrs)

④ Enquiry: Re: Effect on employability

Enquirer: Patient's elder brother

Convenor of Shop stewards in the plant

—

Problems

1. Diff Δ of sudden loss of consciousness at 42 ∈ no elicitable signs.
2.] Medical Fitness of Fork lift Drivers.
3.] Risks of work.
4. O.H.S Responsibility.
5. Course of Action taking into consideration brothers position.
6. Effect on Employability —

(1)

D. ff Δ

SYNCOPE

I. CIRCULATORY

A. Peripheral
1) Psychogenic (vasovagal)
2. Postural Hypotension
3. Increased intrathoracic pressure (Tussive syncope)
4. Peripheral circulatory failure

B. Cardiac

1. Alterations in rate or rhythm
   a. Bradycardia
   b. Neurogenic - Hypersensitive carotid sinus
   c. Ectopic tachycardia - Ventricular fibrillation.
2. Acute Myocardial injury
3. Mechanical hindrance
   a. Aortic stenosis
   b. Chronic Pulm hypotension
   c Pulmonary Embolism

II. Chemical - Defective quality of blood
   1. Hyperventilation
   2. Hypoglycemia

III. Cerebral
   1. Cerebrovascular disturbances
   2. Epilepsy.
   3. Emotional disturbances Anxiety, hysteria

SEMI-COMATOSE

Not Food / 1. Intoxications - alcohol, barbiturates, opiates
2. Metabolic disturbances
   - Diabetic acidosis
   Uremia
   Addisonian crisis
   Hepatic coma
   Hypoglycemia
   Hypoxia

3. Sevcre Systemic infections
4. Circulatory collapse.
5. Epilepsy.
6. Hypertensive encephalopathy
7. Hyper or hypothermic
8. Concussion.

II - Meningeal irritation - 1. Sub Arach Haem"
2. Infections

III - Focal - Brain haemorage
C.V.A
Brain Abcess, Tumor. Thrombophlebitis

Important to consider

1. Petit mal epilepsy.] Petit mal triad
2. Akinetic seizures
3 Myoclonic "

Trauma
Neoplasm
Vasc disease
Alcoholism.
Drugs
Degeneration

'Epileptic' fits

1. Dieldrin aldrin, endrin] isolated fits with no other pathological effect and at relatively low exposure levels.
2. B.H.C Lindane
3 Methyl bromide only after gross-exposure following an accident
4. Lead.

LAW re: Medical Fitness Standards required of drivers.

1. Declarance of disability, before issue of licence
2. Prescribed disabilities

30/10/73 The Physical Environment Mr G. W. Crockford

A - Electro-magnetic radiation

Ionising
Non-ionising
Ultra violet
Visible 400-750 nm
Infra red
Microwaves

B - Thermal environment
Temperature
Heat
Heat transfer

C Pressure - Hypo and hyperbaric

D - Noise

E - Vibration

Relevant aspects
1. The Physics
2. Medical Aspects
3. Measurement
4. Criteria standards
5. Problem Solving.

Ultra violet

1. Natural environment 5-10% of sunlight
2. Use for sterilization
3. Given off in arc-welding

Effects on Eye – absorption
opacity

Skin – cancer.

Protection

i) Goggles for eye
ii) Skin creams.

Visible light

1. Bright sunlight.
2. Bright artificial light
↓ 1% reflected from surfaces affects eye.

Protection i) For eyes - for particular wave lengths
ii) Shade lights – prevent reflection

Microwaves

1. Wave lengths less than 10 cms are absorbed by thermal receptors
2. 10-30 cms – absorbed by subcutaneous fat.
3. More 30 penetrate into deeper parts of body.

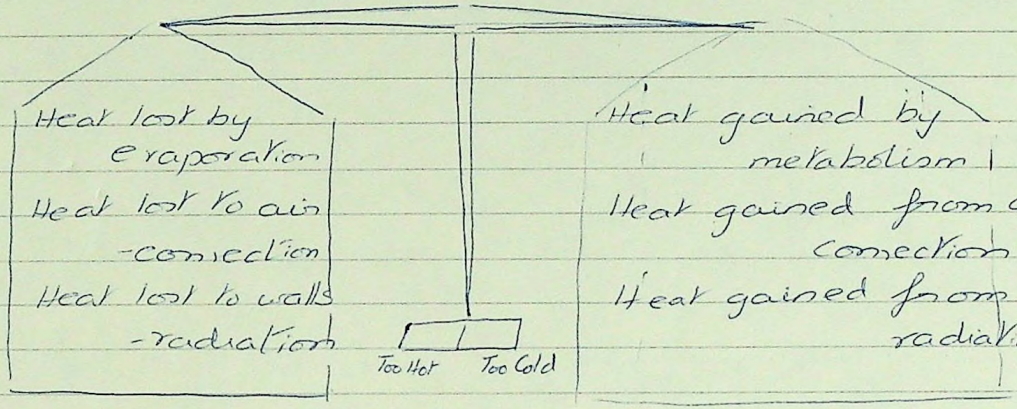
Threshold L.V – $\frac{1}{100}$ th of watt during normal working hours

—

Heat loss

1. Radiant heat exchange - depends on environmental temp.

2. Convective heat exchange - Very little at 30°
200 watts/m² - 0-10°



Heat Equation

M - W

Metabolic Load - Work = Evaporation + Radiation + Convection + S +

- Psychrometric chart

Ref: Measurement of environmental warmth in SI units

1) F.P. Ellis, F.E. Smith and J.D. Walker

Reprinted from Brit Journal of Industrial Medicine Vol 29 p361, 1972
BMA, Tavistock Square - London - WC1N 9JR

2) IES Code for Interior Lighting

1/11

SAFE WORKING CONDITIONS

Safe - means i) Does not kill
ii) Does not produce disease or discomfort
iii) Doesn't not modify or alter performance

Hazard:

I - Recognition (non-quantitative approach)
i) Clinical
ii) Epidemiological
iii) Toxicological
iv) By Analogy.

II. Evaluation (Quantitative)
Measurement of Agent and Effects.

III Control
i) Engineer
ii) Educate
iii) Enforce
iv) Monitor - a) Agent
b) Effects

Cause - Effect relationship

(1) The Effect e.g death, illness
What
Who
When
Why
Where
How measured?
How many?

(3) The Relationship
Shape
Consistency

(2) Cause (assumed)
What
How much?
How long?
How measured?

The Iceberg

Death	System faliure
Illness	System or tissue malfunction
Subclinical disease	Cell death and repair
Performance decrement	Cell transformation
Exposed	No detectable abnormality
Unexposed	—

What are Safe Conditions

I - For Community

II - At Work
- 40 hour week
- No children
- No aged
- No acutely ill

(a) Those which do not cause significant morbidity or mortality or discomfort.

(b) Those which do not cause any measureable effects on workers

- Working Standards
- Practicality of Standards

2/11 'NOISE' Practical

① Industrial Grade Meter ±5dB(A)
70£

② B+K Danish Sound Level Meter ± 1dB(A)
250£ Brüel & Kjaer

③ Precision grade instrument - measuring dB(A), (B), (C) and various other precision measurements
200 - 800£ (various models)

All these need calibration with a constant level source calibrator

④ - Noise average meter.

⑤ Computer engineering - (small meter attached to lapel of person)

2/11

SEMINAR: VULNERABLE-GROUPS

Dr. S. Gaurav

Defn. A group may be considered vulnerable because certain known predisposing circumstances put them at particular risk

Groups by 1. Age
2. Sex
3 Social Class
4. Occupation – Toxic hazard
Physical "
Mental "
Social hazard - publican

WOMEN.

Occupationally vulnerable due to physiological differences

1. Less heavy than men
lower ratio of strength to weight.

2. Increased susceptibility to toxic hazards particularly in the child bearing age group.

3. The association of menstruation with disability.

4. The need for special care in pregnancy.

5. Women's greater liability to suffer effects of malnutrition or overnutrition (obesity).

Social Factors

1. Women's Lib movement

2. Sole supporters (spouse absent) Single / widowed / Divorced. | Social responsibility.

3. Married women – married before 25th birthday.

4 Occupational problems

Absence – more than men – pregnancy
children social – ill health

Stress – double job, husband's opposition

Frustrations – Training and career opportunities

5. Single women Diseases – more ill health than men in
Training period
Less in middle life.
Retirement – degenerative disc.

Frustrations – Training & career opportunities
Dependancy.
Emotional?

6 Sickness Absence

Men & single women – Same
Married women – higher

7. Morbidity

(Logan 1960) Women more than men – attendance in GP clinics
∴ women go earlier in disease history

8. Mortality – Female Male

Decrease in death Increase in death

– TB ↓
– Child bearing ↓
– Maternal mortality.
– Cancer uterus

Accidents ↑
Lung cancer ↑
Coronaries ↑

YOUNG PERSONS

- Arbitrary age-group 16-18
- Young not as vulnerable as they were thought to be

1. Heavy work - muscle + bone development affected.
2. Increased susceptibility to toxic hazards
   e.g Irradiations, toxic chemicals
3. Young women - menstruation, pregnancy
   - often illegitimate
4. Men - effects of illegitimacy - indirect stress
5. Malnutrition and obesity
6. Psychological vulnerability - Adolescent problems.
7. More affected by jobs they don't want to do.
   - Frustrations?
8. Interest or lack of interest at home can affect them more than usual.
9. Need variety in jobs more than older people
10. Drugs + Alcohol -

Preparation for Retirement:

1. 55' Statutory age in Japan.
2. U.K - ♂ 65, ♀ - 60

Artificial concept when age fixed arbitrarily.
- Not chronological
- Socially accepted age at which occupation is changed or given up
- Office job - retirement pressures ← other people performance

Population
UK 1971 - 55.6 - Total
33.5 - working
8.9 - retirement → 10 million.

① Preparation for what - Death

Consideration Taboo
as far as Church
Medical Profession goes.
- Money
- Health
?

② - Increasing morbidity

③ How to use available time?

④ Nutrition

⑤ security of possession - fear of dispossession.
⑥ Fear of being dependent on others
⑦ Fear of neglect & Loneliness
] Mental Health.

(8) Concern over bothering the doctor
- failing to realise that this is the time when he need most help

(9)

Education
1. What to teach
2. How to teach.

Employers need to realise their duty to prepare elderly for retirement
- same as education of children 50 years ago.

Doctors Role - Initiation of project

10/11

History of Occupational Health Services

Dr Schram

Early civilization - Greek, Roman, Indian, Chinese
In addition to agriculture, the industry of Mining began - and there is mention of attempts at industrial health among the slave-labour.

1556 - Agricola "De Re Metallica"
1567 - Paracelsus "Mining accidents"

17th C - Bernadino Ramazzini. - Father of occupational health.

18th C - Industrial Revolution. - series of inventions

1709 - Seed drill Tull
1709 Smelting iron Darby
1731 Sextant
1733 Flying Shuttle Loom Kay
1756 Portland Cement
1763 Chronometer
1769 Hargreaves spinning Jenny
1769 Steam Engine - perfected by Watt.
1769 Spinning machine Richard Arkwright
1779 Crompton - Spinning Mule.
1784 Wrought Iron
1779 Iron bridge - Darby
1789 Power loom - Cartwright.
1792 First cotton gin.
1795 Born - Dr Thackrah. (Father of Industrial Medicine in England).

Book: The effects of Arts, Trades and Professions on Health & Longevity

19th century.

1804 1st Railway Engine – Trevithick

1802 Health and Morals of Apprentices Act.
(no inspectors)

1807 1st steamship – Robert Fulton (U.S.A).

1814 Railway – Steam Engine – (Stephenson)
'Puffing Billy' – used in Newcastle mines

1815 Safety lamps. Humphrey Davy.

1819 First FACTORY ACT – Lord Shaftesbury
(still no inspectors)
- Age limit for children at work (9yrs)
- certifying factory surgeon
(Appointed factory Doctor)

1833 FACTORY ACT - No night work – less (18 yrs)
12 hrs maximum working day –
2 hrs schooling / day
9 yrs minimum.
Appointment of 4 Inspectors

1834 – Dynamo (Electricity) – Michael Faraday

1837 Telegraph.

1839 Bicycle

1842 – Mines Act
– women & young children removed
– older male children allowed

1845 Pneumatic tyre.

1855 Aniline dyes.

1864 Electromagnetic Waves - Maxwell.
1870 EDUCATION ACT
1876 Telephone - Graham Bell
1878 1st Chief factory Inspector - Alexander Redgraves

1880 Electric Light - Joseph Swan & Edison
1884 Steam Turbine.
1888 Perfected pneumatic tyre - Dunlop
Tarred roads - Macadum
1875 Internal combustion engine
Marcus, Benz, Daimler } Cars.
1892 Diesel Engine.
1896 Roentgen - xrays
Curies - Radioactivity
1896 Marconi - Radio signals
1897 Thomson - discovered electron
1898 T. M. LEGGE - 1st medical factory Inspector
Legislation on lead poisoning.

—

20th Century

1903 Aircraft (Wrights)
1909 Channel crossed by Bleriot.
1911 Health Insurance (National scheme)
under Lloyd George - Labourer and not whole family or unemployed.
1914-8 1st World War - reversal of early Epidemics in camps healthier trends in industrialisation.
1915 Health Munition Workers Committee (U.K)
1919 Industrial Fatigue Research Board. (Health)
↓
Medical Research Council.

1919 Atom split - Rutherford.
1926 T.V. Baird.
1928 Jet Engine

1937 FACTORY ACT

1940 Radar
1939-45 - IInd world War — Bombing produced many problems.
- Blood Transfusion
- Start of Antibiotic use
- DDT → against Typhus (Naples epidemic)
- Antimalarials
- Important studies in nutrition in POW camps.
1944 - Rehabilitation
1958 Campbell - 248 mph on water
Comet 6 hrs 12 min across Atlantic.
1962 Space shots.
1972-72 Man r car on Moon

—

SAILORS - Health

1. Power - Oar → Sail → Steam → Oil → Electric Atomic
2. Design of Ships

17th-18th Century 1297 A.D - Chinese Compass
15th C - Western Compass
1492 - Columbus's Voyage
SCURVY - James Lind Scurvy pts
1747 - Lind's experiment on Sailors (12).
2 - Garlic + mustard seed
2 - Cyder
2 - Diet - gruel - mutton broth, raisins
2 - ½ pint seawater daily
2 - oranges r lemon — In a wk pt up r about R, others

1753 Lind's "Treatise on Scurvy"

1768 Lind's Reforms

Followed up by Blane

1. Citrus fruits (Limes)
2. Recruitment - quarantine
3. Uniforms. - helped c typhus.
4. Fresh water distilled from sea water
5. Physical examn of recruits
6. Cold baths + Exercise.
7. Cinchona bark.
8. Cut down shore leave for recruits in tropics

- Also accepted by Cook - during his voyages

Diseases on Ships - Scurvy, Plague, Typhus, Malaria, Yellow fever
- disrupted trade due to effect on voyages

1856 Paris - Quarantine Convention

1902 Pan American Sanitary Bureau.

1907 Paris - Office d'Hygiene Internationale

1919 - International Labour Organisation.

By 1920 - Free centres of VD treatment in ports.
- Safety - lifeboats
- Emergency Rx - Introduction of Manual for captains
- Studies on Heat exhaustion.

1920 League of Nations set up (Health Dept).
particularly interested in S.P., Typhus, Plague. Relapsing fever, Cholera, Yellow Fever.

1950 - Atomic powered ships.
- Psychological stresses.

5/11

HUMAN BEHAVIOUR

1. Psychomotor (Physical activity)
2. Cognitive (intellectual)
3. Affective (emotions)

ERRORS

1. Psychomotor job (Physical skill)
   i) Work done & No. of accidents

2. Decision making (Thinking skill)

'unsafe act' 'unsafe attitude'?

Decision — i) Limited choice.
ii) open-ended.

Cognitive objectives:

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

Simplest ↓ Complex

Knowledge - a demonstrated ability to recall facts

Comprehension - interpreting, translating, understanding

Application - use of abstractions in particular situation

Analysis: Breakdown into constituent elements

Synthesis Composition of a unique communication.

Evaluation Testing against criteria - judgement

Research findings

1. More work done - more accidents (Psychomotor)
2. More experience - less accidents
3. New recruits - more accidents

5/11 HYGIENE STANDARDS-II Dr. Carter

1. TLV
2. MAC
3. Emergency exposure levels — E.E.L's
   - based on short term exposure to evolution of large amounts of gas or vapours
   - immediate effects considered

4 Community standards - (esp for atmospheric pollution)
   based on i) hazard
   ii) nuisance value
   - noise includes both factors
   iii) Damage to flora & fauna in area of hazard
      a) birds
      b) pollutants can be concentrated in food chains (biological)

How are standards applied?

1. By Legislation (statutory)
2. By mutual agreement between parties concerned — (voluntary)
   Doctors, hygienists, management, TU's, gen. public.

Statutory	Voluntary (Advisory)
1 All employees can be made to comply	1 No direct relation to law
2. Employees usually comply because they can be taken to court	2. Can be introduced rapidly
3. Takes long time to introduce esp if new	3. Can be changed quickly
4 They have to be worded in legal language.	4. Can be arrived at more readily
	5. Simpler language can be used - management and union easily agree

Statutory
- only minimum stds can be applied
- not always desirable.

Voluntary
on wording
& Does not lay down any legal penalties

Procedure

Medical Evidence of Hazard → Study of Agent + Response (Measurement techniques)

Dose-response curve → Decision on acceptable level of response [medical selection]

Discussions ⇄ union and management [Politics] → Setting Standard

Setting Standard → Mandatory / Advisory

Static or Mobile

Type of sample - in respect to time

i) Spot sample - quick
eg Kitigawa - easy
- lot of readings reqd to get accurate result
- effect of sampler (person) on environment?

ii) Over period of time.

iii) Continous sampling - mercury vapour meter.

Where: depends on why

i) Personal sampler

How depends on

1. Particle size. Size selectivity apparatus

TLV are not size selective

After dust collected
1. weigh.
2. Chemical analysis
3. counting particles - clumping makes it difficult
- size determines accuracy of count

Errors
1. In technique - right place
right time
suitable method
2. In actual collection.
3. In analysis: e.g Kitigawa for benzene also tec for toluene
4. In calculations.
5. What did the results mean
- are conclusions right

5/11 Thermal Environment Mr Crakford

Heat Disorders

1. Heat stroke - Heat exhaustion from
circulatory deficiency
water deficiency.
Salt deficiency.
Sweating

2. Skin disorders
- Prickly heat
- Anhidrosis
- Sun burn.

3. Psychoneurotic
Mild or Chronic (Tropical) Heat failure.

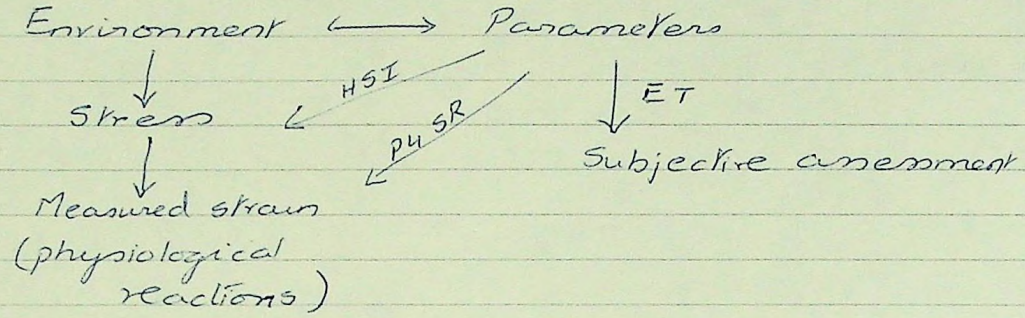
Classifications of Hot environment

1. Hot humid
Treat as an environmental contaminant or parameter

2. Hot dry
High dry bulb Low dry bulb
omni directional
radiation
uni directional
radiation

3. Clothing - metabolically induced
a) Ergonomic problem
b) Clothing technology.
c) Environmental

Measurement



i) ET - Effective temperature (½ Hr)
ii) P4SR - Predicted 4 hour sweat rate — person in chamber and subjected to phys. strain which is measured
iii) HSI - Heat stress index

↓ mechanistic or engineering approach

↓ Dry bulb, Velocity, Wet bulb, Radiation, M, Clothing

- Index must be a suitable measure of the environment to be dealt with.

Colder environment - Wind chill, dry bulb

Hot environment — HSI, P4SR, WBGT, CET (CET)

Criteria

1. Comfortable environment
2. Un " " but physiologically safe (ie. physiologically mechanisms are able to cope)
3. Physiologically unsafe (tolerance times definable)

Criteria can be defined on the basis of i) environmental temperatures
ii) Body temperature

Investigation of a complaint of 'Heat discomfort' in a printing works

1. Determine i) who is complaining ii) where
   iii) what processes iv) when v) why vi) Time of yr.
   – all these details must be obtained.
2. Go to site: Look round for possible gradients and other factors that may contribute to discomfort –
3. Check where men are working and try and determine special points or areas of the environment which will be most representative of the situation e.g 60-90% of their time
   – Also special conditions or situations in which they work even for short periods of time (e.g 10% of their time)
   – check on diurnal or other variations of these conditions
4. Other Factors (2) i) Type of work iv) ventilation of place of work
   ii) Clothing – general
   iii) Protective clothing – gloves, overalls
5. Make physiological measurements on men
   i) Pulse rate 120/min and above – good measure of thermal load above 110
   ii) Temperature – not such a good measure
6. Diagrammatic representation of situation
7. Analyse data
   i) Heat problem or not?
   ii) 'Comfort' ? or stress? situation
   iii) What index to be used?
8. Consult a Engineer to determine possible remedial measures i) Improve or resite ventilation
   ii) enclosure of hot machineries.
   iii) decrease contact.
   iv) air-conditioning

- change working conditions - shorter exposures
  Shift of work.

7. Report - to Management or Engineers for further action

7/11

Inspecting a Factory

Name: Imperial Chemical Industries Ltd.

Address: Paints Division
Wexham Road
Slough - Bucks

Situation: 30 acre Industrial complex incorporating the head quarters of the Paints division of ICI and one of the largest paint producing factories in Europe and a Research and Development centre.
Situated in the Thames valley on the outskirts of satellite town of Slough less than 1/2 mile from the station.

Other factories under same division are situated at Stowmarket and Glasgow + small wallpaper manufacturing unit at Oldham

Products
1. Paints - Gloss and emulsions
2. Topcoats for other industrial products esp car finishes
3. Varnishes

30,000 gallons/day Range of 1000 colours + products

What is paint? Main constituents are.
1. White or coloured powders -(pigments.)
2. a liquid binder -(resin)
3. a thinner (solvents)
4. Dryers, anti skinning agents and tinters (additives)

Steps in Manufacture
1. Reception and storage of pigment and solvents
2. Manufacture of Resins (synthetic products)
3. Dispersion - mixing of resin with pigment.
4. Mixing - Addition of thinners and additives

5. Testing and certification of product by control lab.
6. Filling: Transfer of finished products from large mixers to tins and drums
7. Warehousing
8. Despatch

In addition

9. Emulsion plant
10. Cleansing plant

Hazards — Main Fire hazard

1. Reception & storage - Handling of pigments & solvents?
   Lead oxide, Iron oxide, Rare earths & oxides, Synthetics
   * White spirit, xylol, Toluene, Naphtha, Ketones
2. Manufacture of Resins (Not shown)
   - Acrylics, amide acryl nitrile, epoxy resins urea and melamine, polyvinyl acetate copolyme
   - Made in reactors called kettles - raised to temp 250°c process lasts 12 hours. Product thinned, filter pressed and pumped to storage tanks
   - All closed processes — Noise ++ (90 dB)
   - Only potential hazard

3. Dispersion - by ball mills (large steel drums half full of steel or porcelain balls which cascade as drums revolve) Also Attritor, sand mills, high speed mixers
   Hazard: Noise 90 dB - ear muffs
   Fire — Handling (contact) — protective clothing & goggles
   Irritant odours — ?
   Lone worker?
4. Mixing — 11,000, 5500, 2750 litre capacity mixer
   Noise
   Fire — + Solvents* + Additives - isocyanates (processed therefore non-volatile)
   Transfer < direct thru pipes / Portable transfer vessels (vapours)
5. Emulsion paint - Titanium di oxide + water base instead of PVA — Dust hazard - not irritant (local exhaust ventilation)
6. Cleaning unit - Caustic soda - skin & eye irritant, chemical burns
   protective clothes, goggles, interlocked devices
   effluent disposal?

7. Filling & packing - conveyor belt - minimum handling
8. Warehousing - bin & pallet storage
   Fork lift trucks
   ] very good safety record
9. Asbestos of Lagged pipes ——

—

Environment:

1. Construction
2. Lighting - good.
3. Noise hazard + (- being looked into)
4. House keeping - not very good
5. Dust hazard in Emulsion plant
6. Ventilation - good 6 air changes/Hr
   + Local exhaust ventilation
7. Disposal of wastes by neutralization
   Alkalvie effluent by cleaning process
   Acidic " From pretreatment plant

—

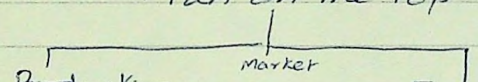
9/11

MANAGEMENT

- Fr. - Frenchman who first wrote on the principle of management
- Taylor - Scientific management - based mainly on production
- After 1930 - 'Human relations' skewed in management
- Unionization and increasing participation of workers

Structures

I -



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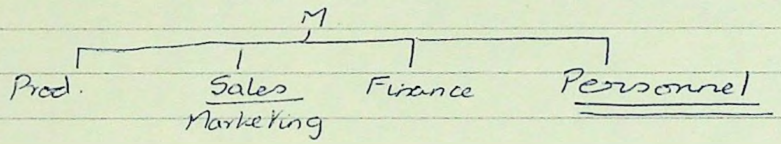


Production: - Getting the product made
- increasing complexity

Selling - active sales function
Marketing - total orientation of company to meet customers needs
Finance - control of money - budgeting & accounting

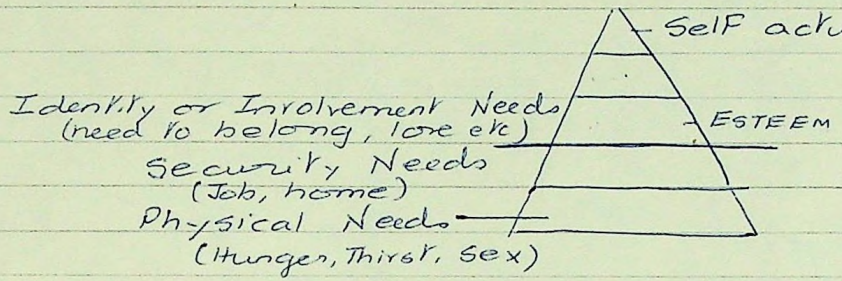
PERSONNEL

i) Welfare Phase
ii) Recruitment
iii) Wages & salaries (policy)
iv) Industrial Relations
v) Training. 'Sit by Nelly' (earlier policy)
1964 - Industrial Training Act.

Manpower planning

vii) Behavioural science approach

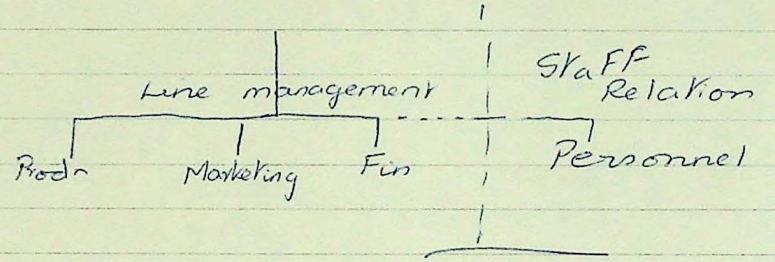
Maslow (US Psychologist) - Hierarchy of human needs



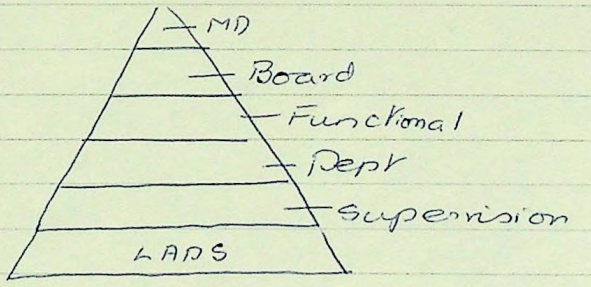
- 'Participative' management

↓

III



Classical Structure



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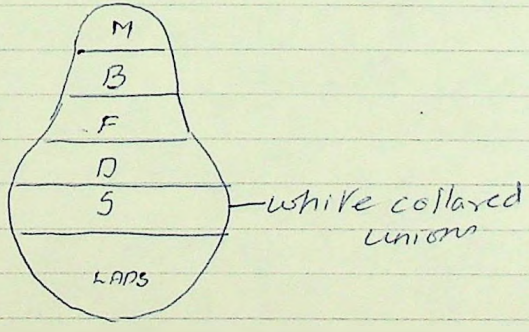


14/11

INDUSTRIAL PSYCHOLOGY

EMOTIONAL SATISFACTION AT WORK

Medical History – usually includes Occupation in identification data - but usually (generally) one vague term is written without any qualifying details

Satisfactions

1. Security.
2. Appreciation of work being worthwhile
3. Sense of responsibility.
4. Appreciation of person
5. Interest in the job.
6. Belonging to a working group.
7. Progress or possibility of promotion

Belonging.

- 'Unwanted child'
- 'Odd man out'
- lack of identity in group or party.

Effects – Anxiety of Individual
- Conciliatory → Acceptance by group
- Aggressive → Hostility of group → Person acts tougher → Rejected by group

- Duty of leader of group, foreman, host, organiser or personnel office to prevent rejection by group in different situations.

- English Custom – Talking about weather'
  - used to test out strangers – If you agree

with view on weather - you are accepted.

French Custom: Subject of weather brought up when conversation to be ended (hint)

—

Interest in Job depends on

i) Intrinsic nature of job
ii) Personal choice of job
iii) Reinforcing appreciation of parents & friends
iv) Freedom of expression in job.

If creative interests supressed - Expresses as agressive destructive behaviour.

Education ~ Criticisms

1. Educating for the impossible.
2. Educating to excel

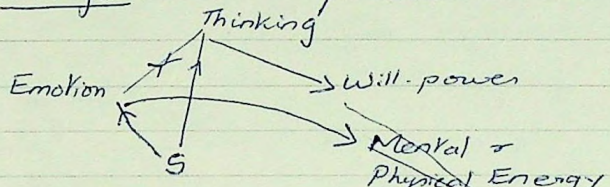
Appreciation - seldom practiced by heads of organisation routinely.
- usually call up subordinates when something is wrong. - never to congratulate on good work.

Responsibility
- born with? or given or 'trained for'
- planning or schedule of work can breed irresponsibility.

REACTION TO STRESS/STRAIN

Civilised Human being – Emotions and reactions repressed e.g do's & don't's dictated by society

Savage - S faced with a situation e.g Leopard



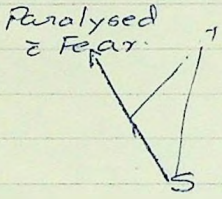
I – IV Reactions

I – Preparation (for action)

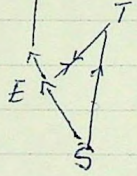
Action

Fight Run away

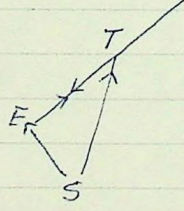
II



III Action & our thinking (Climbing up a tree)



IV Too much thinking.



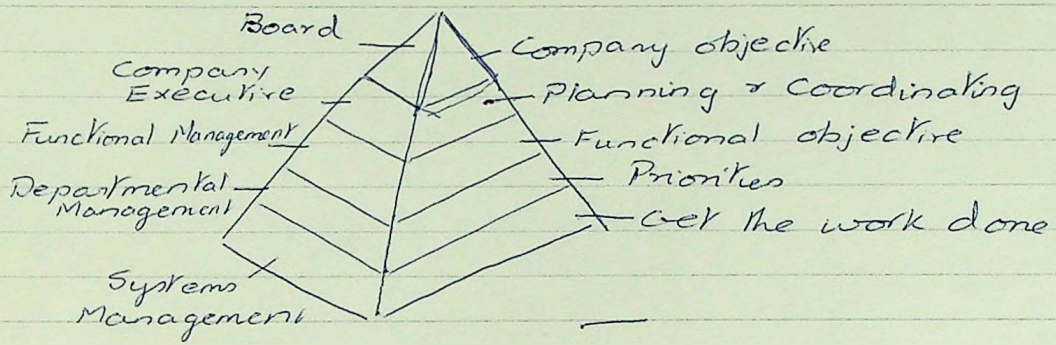
∴ Thinking and will power modify and repress ones reactions in society (presence of others)

– Also taught to modify by constant correction.
– 'not a nice thing to do'

In Industrial situation ± conditions modified by i) Strike & Trade Unionism
ii) Management training

—

Aggressive Reactions – Internalised → Suicide
\ Externalised → Destructive behaviour
Modified by – Alcohol
\ Drugs
Accident prone-ness



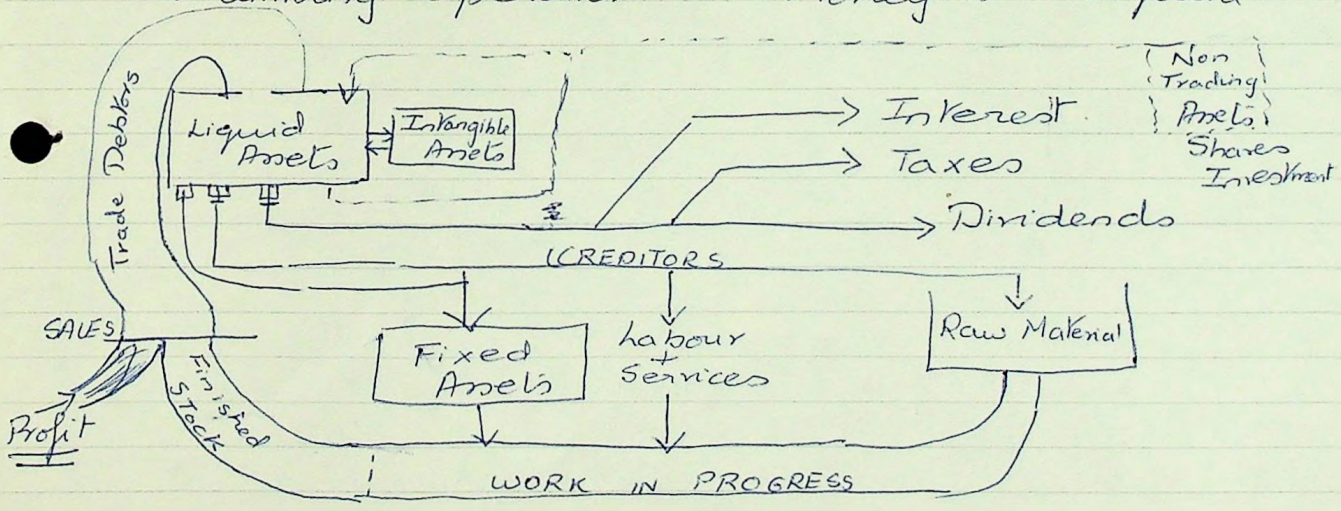
- 'Hawthorne effect' – classical experiment.

? Motivation and Job enrichment

Mcgregor < Theory X – Lazy, belligerent, uninterested
Theory Y –

Finance

'Plumbing operation' Money is the fluid



Personal Accounts

DATE

CAPITAL

Long Term Liabilities
Mortgage
Central Heating

Current Liabilities
Furn. Shop (R)

Fixed Assets
At Cost
House → Appreciating
Furniture
Car → Depreciating

Current Assets (Liquid)
Cash in Bank

15/11 CASE DEMONSTRATION Dr. Veys

OCCUPATIONAL BLADDER TUMOURS in Rubber Industry

Processing of Rubber

1. Natural / Synthetic] Raw material
2. Bale cutting
3. Premastication - compounding ingredients
4. Weighing
5. Batch box
6. Banbury mixing.
7. Sheeting on primary mill.
8. Cooling
9. Rubber Stock → Rubberising
10. Reheating.
11. Calendering → Tyre making → Conformation.

Morbidity - At Risk 1950 - 2031 → Followed up

Cases of Tumours → Observed - 23
Expected - 10.3

Antioxidant - β naphthylamine.

Workers at risk

Association linked ∴ Causation.

1. Chemical and dyestuff industries.

15/11

Organisation of Safety

I - Ford

- Management keen on safety.
- Safety officers - work localised to different units in factory
- Regular monthly meetings.
- Suggestion boxes - ? feed back
- Posters
- Telephones well sign posted
- Accident reporting (handout)

New concrete floor
- dust problem
- non-fibrogenic

- Benzene
  Co
  Trichlorethylene (degreasers)

II - May & Baker - 150 yrs - Range of Activities

Special Safety procedures for specific hazard

1. Disposal of Effluent.
2. Dimethyl sulphate plant - closed process
   - protective measures also available
3. Sulphonamide plant
   - Toluene, pyridine,
   - Automatic CO_2 extinguishers
   - Resp. apparatus, eye soln., mask
4.
5. Autoclave room - Risk of H_2 hazard.
6. Cyanide plant - General and local ventilation
   Closed process
   Barrels painted white and Amyl nitrates (emergency set) ampoules
7. Hydroquinone 95 dB A
8. Antihistamine plant - Dermatitis (sensitization)
   shower, laundry, sterile & unsterile area

9. Methyl Bromide - no masks
- no environmental monitoring during accidental spillage.

Radiochemical Dept
- Close security
- Small working population
- No definite monitoring system - occasional urine test
- empirical

Biological Dept
1. Viral infns like serum hepatitis
2. Animal bites - special gloves

Accident Prevention Comm. Hee
Mr B
Safety Code for Chemical Workers

General Safety Procedure
1. Reporting: i) International reporting
ii) Day to day accident.
2. Info on nature and site of accident
- compared internally
- yearly trends expressed graphically.

- Safety code book.

- Safety policy agreed by management and trade Union
- Policy of incentives

Safety Action - Regular Meetings
Reports
Responsibility & to shop-floor level.

III - General Foods: - Collect Diarrhoea Record Sheet.
- "Consumer safety".
- Diarrhoea record sheet
- 'Carriers' among Food handlers
- Protective measures

IV. Kodak - Multinational
- Autonomous in responsibility but not major policies
- 3 safety officers and a hygienist
- 1 lost time / 30 property damage or minor accidents / 600 near misses

50-1000$ / 7 $

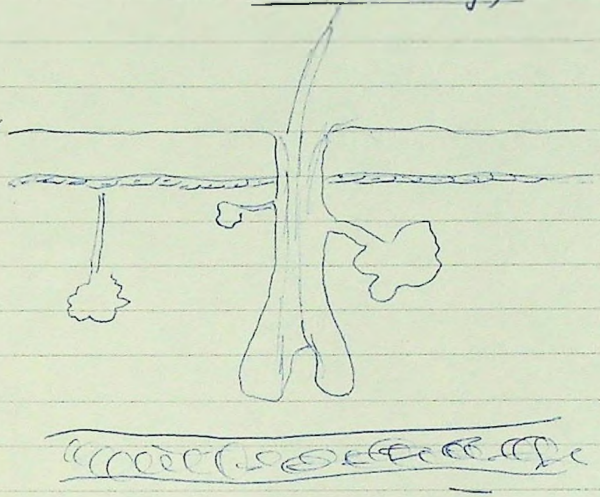
Major accident more than 3 days - 1000$ +.

- Accidents - 88% - Human error
  10% - Machinery error
  2% - Acts of God
- Second largest chemicals users of Silver (next only to Bank of England.
- 7000 chemicals / used per day
- Very well organised built in safety technology

20/11

Dermatology

Anatomy of the Skin



Maccule – i) Vitiligo
ii) Mongolian spots

Acne Papule → pustule → cyst
→ black heads

Slides shown

1. Psoriasis
2. Pemphigus
3. Acne vulgaris
4. Eczema.
5. Urticaria
6. Pityriasis rosea
7. Impetigo
8. Cystic acne
9.

Investigation

1. History: - Details - itching not that important.
2. Biopsy -
3. Immunofluorescence - pemphigus r pemphigoid

20/11

Occupational Health Nursing.

Mrs Margaret Williams

1. Health Supervision
2. Environmental Control and Accident Prevention
3. Health Education and counselling
4. Treatment (emergency)
5. Rehabilitation and Resettlement
6. Records (interpretation/ reports)
7. Co-operation with other agencies.
8. Additional services according to local conditions.

Additional skills / knowledge above SRN

Ref: i) Occupational Health Nursing - 'Booklet' (25p)

Royal College of Nursing &
National council of Nurses of U.K
Henrietta Place.
London W1M 0AB

ii) O.H.N Structure (20p)
iii) A National O.H. Service. (25p)
iv) Implementation of a hospital OH Service - 15p.

Permanent commission & International Association O.H.
Nursing Sub Ctee - Secretary c/o RCN Above.

The Nurses Contribution to the health of the worker. 25p

20/ii

Auditing the performance of a O.H.S.

Monitor
Evaluation, assessment.

Ref. B.M.J - Jan, 1973
i) 'Management for Health" by Maxwell

ii) Doctors in an integrated Health Service - Scottish Home office

Management

1. Planning
   Better information of present services
2. Policy makers and implementors should work together
   - Programming
   - Monitoring.
3. Better analysis of problems and opportunities
   - maximise your opportunities.

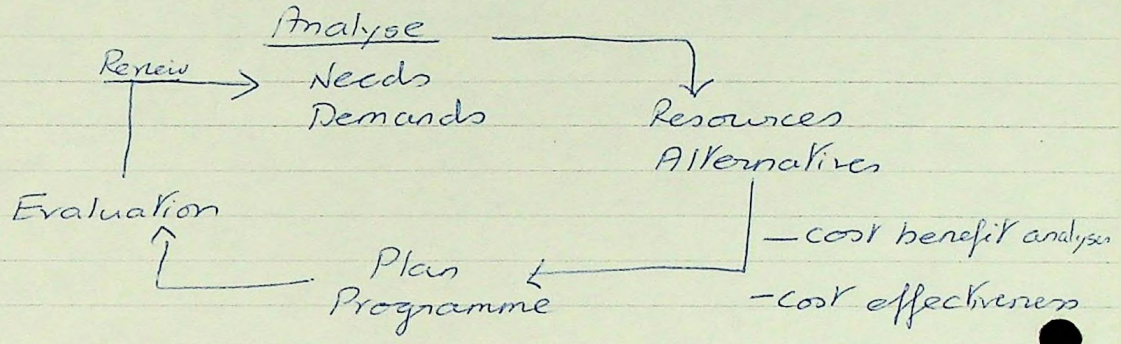
Health (Care) Planning Teams
i) Multidisciplinary.
ii) Support from community
iii) 2 types — Standing — Pt. groups — old / children
ad-hoc

Irish Philosopher
Finagle's Law on information

1. Information you have is not what you want.
2. Information you want is not what you need
3. Information you need is what you can't get or cannot be collected

Evaluation:
Ref. 3) 'Michael Warrens' - Chapter on Evaluation. in "Management & Health Services"

Evaluation as part of Management cycle



Ref. Efficiency and Effectiveness
— A L Cochrane
'Coronary Care' Mather

Objectives

1. Reasonable - unreasonable
2. Quantitative — rather than qualitative.
3. Specific not general.
4. Result oriented.
5. Time bonded.

Features to be Evaluated

1. Coverage.
2. Outcome. - applied epidemiology
3. Activity analysis
4. Economics.
5. Acceptability

"Don't bother me now with the facts
I am making decisions"

20/11 The Older Metals Dr Donald Hunter

Metals

Metalloid - Antimony, Bismuth
Arsenic, Tellurium

Alloys

—

Lead
- lead nipple shields
- lead in cracked mill stone
- lead in printing.

Encephalopathy (children)
Only Motor nerves
No sensory involvement

Stippled cell count
Dark ground illumination

Axioms of Thomas Legge

Preventive Medicine < Parson?
Doctor?

Storage & elimination of Lead

1861 Gusserow } Lead in bones
1871 Heubel }

1911 Straub } "Lead stream" Theory.
1913 Erlenmeyer }

1921 Aub } Analogous metabolism of Ca and Pb
ro Minot } $Ca_3(PO_4)_2$ - $Pb_3(PO_4)_2$.
1926 Fairhall }

Age hardening of an alloy.

—

Slogan of WHO "Health is a fundamental right, but it must be won"

—

27/11

Mercury

1. Electric meter - cleaning of plate
2. Mercury thermometer.

'Salivated' term used by army for Rx of pt ē syphilis ē Mercury

Features imp i) Tremors
ii) Salivation.

- History - Aristotle, Galen. (quick-silver)
- Hg deposits in Idria (Yugoslavia)
  Fore in Hg mines → death of all th.
- Other deposits - in Madrid (Spain) & California
  ↓
- HgS (Red mercuric sulphide)
  ↓
  Miners come in contact ē Hg in pure metallic state while working on mine face occasionally

- Oxo - not more nutritious than salt water.
- Mercury Mirrors - Ballroom in Hampton Court now replaced by silver mirrors

Furriers (Felt Hat) - soak fur in vats of Nitric acid and mercury.

Organic Hg - compds used to kill infn of wheat plants (Fungicides)
Mild polyneuritis →
↓
Chronic poisoning.

Methyl mercury iodide
Ethyl " chloride
Phenyl mercury acetate
Tolyl mercury acetate

- Lower molecular wt compds in organic series usually much more toxic than higher molecular wt.

- Methyl compd organic Hg i) Tremors - handwriting
  ii) Cortical blindness

Minimata's disease
— Astereognosis, Cortical blindness, Sensory paralysis
— 'Minimata Telegram' —

— Manganese di oxide (Black soil in India) (Pyrolusite)
— Manganese steel (alloy) Mysore state in India
Ferro Manganese

i) Drilling done by underground methods produces dust.
ii) Fumes from smelter.

Symptoms - 'Manganese steel' rigidity (Parkinsonism)
"lead pipe"
Manganism - writing becomes smaller and smaller
pathological laughter.

Beryl ore - $BeO \cdot Al_2O_2 \, SiO_2$
precious stones - emerald, aquamarine.

- Granulomatous chest
- granuloma on the skin
- Gen. Systemic berryliosis

22/11/73

Occupational Respiratory Disease

Prof Schilling

Ref:

1. Morris.
2. Clinical aspects of inhaled particles — Heimann
3. Respiratory Diseases — Crofton & Douglas — Blackwell — D.C.F. Muir

Most important Group ::

1. Most widespread
2. In many cases they produce
   - permanent disability
   - death.
3. They are missed in early stages because of insidious onset.

Classes 1. Acute exposures
2. Chronic "

3 main classes of agents

1. Gases, vapours, fumes — can also produce systemic damage
   - usually acute responses
   - chemical bronchitis
   - " pneumonitis
   - pulmonary oedema.
   - Asthma.
2. Mineral dusts
   - usually chronic tissue response
   - fibrous
   - granulomatous change
   - pneumonitis
   - malignancy
3. Organic dusts
   - usually pharmacologically or

immunologically responses
- Acute, chronic or recurrent.
- cotton, hay etc

Imp to remember
1. Systemic effects of group ①
2. Possibility of mixture of fumes
e.g. Arc welders — O_3, NO, metallic fume.

In ① - Asphyxiant gases and chemical asphyxiants are not included

Gases
1. Chlorine - pungent smell which has an immediate effect
- can also cause lung edema and irritation of tissue

2. Phosgene - delayed effect - pulmonary edema

3. Ozone — "

4. Oxides of Nitrogen
Characteristic in silo fillers

Fume
1. Cadmium - Acute pneumonitis - simulates a viral infection.
- chronic effect - emphysema
- Systemic effect - renal damage.

2. Isocyanates - Toluene di isocyanate (TDI) — used in polyurethane paints.
- also used as insulation materials (polymer comp.

MBI used ∵ lower Vap. pr.

3. Metal fume and polymer fume fevers

4 Riot control gases - CS & Tear-gas
- irritating effects on eyes and airways

5 Paraquat - lung odema & bronchiolitis
insecticide \effect on gas exchange
by damage to alveoli

(2) MINERAL DUSTS

Silica (SiO_2) -

i) Bedouins - do not get silicosis because sand not finely divided silica

Classically - seen in a) monumental masons
b) miners
people who break through siliceous layers to reach coal face

c) people who make abrasive powders

d) Grinders - people who use sandstone
- knife grinders
- meal grinders (African women)

Classic symptom - Shortness of breath
(Fibrotic reaction of lung)

- Silica kills macrophage cell releasing something that causes fibrosis
- TB + Silica → devastating result
- Reaction ∝ SiO_2 can be modified by presence of other materials
e.g Poly vinyl pridine N oxide coating of particle renders it harmless - does not kill macrophage

Coal-workers pneumoconiosis

Epidemiological studies showed that / Simple C W P
\ Progressive Massive Fibrosis

Ref: EMAS Notes

Asbestos

White - Chrysotile = Canada
Yellow - Amosite
Blue - Crocidolite] South Africa

3 Reactions

1. Fibrotic - very disabling.
2. Pleural plaques
3. Cancer of Lung parenchyma.
4. Mesotheliomas - devastating.

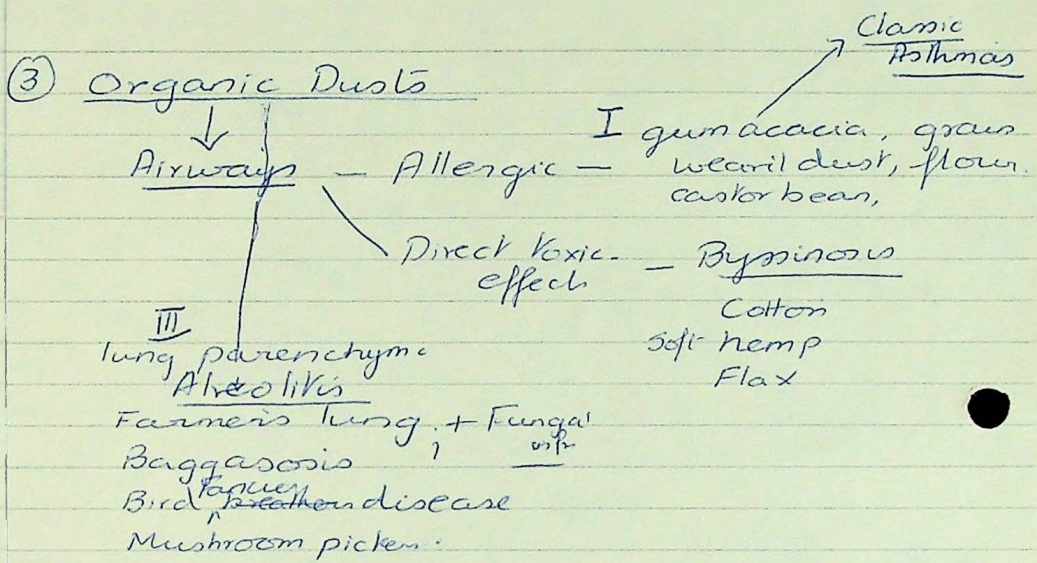
Powdered Silicates

1. Talc
2. Kaolin
3. Mica

Other Metals

1. Berrylium.
2. Cadmium
3. Alluminium.
4. Cobalt
5. Stanosis (Tin oxide)

(3) Organic Dusts



Enzyme Washing powders disease
- whether Type I or III disputed.

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(4) Occupational Lung Cancers

- Increasing difficulty in identification.
- Only method is epidemiological.

1. Asbestos
2. Uranium miners
3. Nickel refiners
4. Arsenical sheep dips.
5. Chloro methy ether ——— latest
6. Hexavalent Chromates.
7. Ionising radiation.
8. Polycyclic Hydrocarbons
9. Iso-propyl oil.
10. ? poly urethane fume being investigated

-26/11 FACTORIES ACT - 1961 Mr. Fish

Department of Employment

Director of Occupational Safety and Health

H.M. Chief Inspector of Factories
|
11 Divisions
|
114 Districts
(General Inspectors)
like GP

Chief EMA.
|
EMA.S

If Act not followed - offence - penalty from 60£ to 300£ (major offence)

Act only lays down minimum standards and the Factory Inspector tries to get every Factory Manager to achieve the highest practical standard.

Aim: of Inspectorate - Every place atleast 1/4yrs - Nowadays a change to more selective visits - a) Large population of workers.
b) Special risky occupations.

(1) Workplaces Inspected

Factories - 200,599
Dock & Warehouses - 4,020
Construction Sites 50,774
Shipbuilding 730
Office, Shops & Railway Premises 180,000
(Inspected by HMFI)

Inspectors
Field - 606
HQ - 76

+ (2) Regulations - Specific standard of protection for each special factory or procedure

- These can be put thru quickly - without much debate - Must lie on table of House for 2 wks.
- Usually formulated in consultation c union & manufacturers

---

(3) EMAS - Regulations re: exam^n of young people

(4) Factory Inspectors also investigate all accidents in factories.
- in 1972 Accidents: Fatal 468
Total 256,137

Poisoning + Diseases 274

(5) Investigate complaints from all sources

(6) Attend all inquests of fatal accident cases in industry

DERMATOLOGY - II

27/11

Eczema / Dermatitis

Defn

Features: 1. Erythema and oedema.
2. Vesicles (oozing)
3. Itching.

Histology
1. Odema of tissue - cells seperated → spongiosis → ++ leads to vesicle
2. Thickening of epidermis
   - lichenification

Types 1. Exogenous
2. Endogenous – Atopic dermatitis (allergic anor c hay fever or asthma)
   - Seborrhoeic dermatitis – excessive dandruff cracking behind ears etc
   - stasis dermatitis
   - Discoid (nummular)
   - Pityriasis alba
   - Asteatotic eczema.
   - Lichen simplex chronicus
   - "Pompholyx"
   - Prurigo nodularis
   - Lichen striatus

varicose eczema

pale patches on skin chronic eczema

Acute vesicular eczema

Discoid n – young women, backs of the hand

Exogenous 1. Primary irritant dermatitis
- stuff on skin - sufficient quantities for sufficient time.

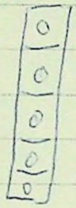
All are susceptible to it
a) Toxic
b) Cumulative insult dermatitis

2. Allergic contact dermatitis - delayed hypersensitivity
e.g. Mantoux Type IV antibody.

3. Photodermatitis

Investigation:

1. Patch Test: — Aluminium foil c̄ discs of guaze
— battering of test substances applied
— covered by plaster
— kept 48 hrs before reading



— Cement dermatitis — matches

eg — garlic " of chef
— turpentine dermatitis
— lanolin — tri-cort'd cream (preservative ethylene di amine)
— parabens — largactil
— vioform — chloramphenicol
— sulphonamide
— Araldite

Diff Δ of eczema on the hands

1. Psoriasis
2. Fungal infn — dry erythematous palm
— nail affecti.
3. Lichen planus on palms looks like hyperkeratotic patches
— nails - pitting, atrophic
4. Maltreated fungal infn

Chloracne i) Commidans (K)
ii) Folliculitis c̄ hyperpigmentation.
iii) Acne on arms → leading to large cysts

27/11

ETHICS

- Deontology
- Moral position of the Doctor in Industry

1. Doctor-patient relationship
   vs Doctor-Employer relationship.
2. Duty to enterprise as a whole
   - over duty to worker or management
3. Relation vis-a-vis medical colleagues
   - general practitioner, hospital doctor
4. 'Sickness-absence studies - not from the point of 'policing' but from the point of new of understanding a social problem.
5. How much information to be given to management?
6. Confidentiality of information - when can it be broken - with pt's consent - and when without.
7. Position regarding Manager & problem e.g Alcoholism.
8. Confidentiality re: Technical information e.g constituents of a product
   - reveal only as much as is necessary for tackling particular problem.
9. Doctor role as a citizen in the community

Role of Industry
1. Profit or loss
2. People.
3. Environment.

"The greatest good for the greatest number sometimes results in the disadvantages for the few".

The functions of an Occupational Health Unit in Khartoum University. Sudan

Mustafa Khogali

Brit. J. Ind. Medicine.
No 2 April. 1966 p154

1. Teaching i) Undergraduate Med. Students.
   ii) non-medical (Engineering) students.
   (iii) Public health officers, I MO's etc.
2. Survey of Industries
   i) Existing services
   ii) Size of various problems
   iii) Investigate health of group of workers and conditions under which they work.
   iv) To detect and measure the prevalence and severity of any occupational health hazard
   Cooperation of Min. of Health, Min of Labour
   Factory Inspectorate.
   Students
3. Research.
4. Library.
5. Occupational hygiene Laboratory.
6. International relations - advice of
   - other universities
   - International L.O. LSHTM etc

27/11

Personnel Selection and Assessment

① JOB ANALYSIS
↓
Man requirements
↓
RECRUITMENT
↓
Reception of Applicants
↓
SELECTION
↓
Application Blank
↓
Tests & Interviews
↓
Preliminary Selection
↓
Reference checks
↓
Medical Examination
↓
SELECTION DECISION

Validation ← or evaluation to improve the system.

SELECTION DECISION → Reject, File, Select
Select → Train, Place

② Questions to be answered re: applicant

1. Can he do ? or
   Can he be trained to do the job?
   → Abilities
   Aptitude
   Performance < attainment / Trade
2. Will he do it ?
   → Interests < General / Vocational
   Values/Attitudes
3. How will he do it ?
   → Personality

① Maximal performance
②③ Typical performance

(3) A Test

What: Sample of Behaviours.
Standardized situations
Systematic

Qualities: Reliable
Valid
Objective

Purpose: Compare
Understand
Predict

Tests: i) General ability
ii) Special ability – mechanical
– spatial

(4) Interests' information. Kuder
Rockville

1. Expressed. – what they say?
2. Manifest – what they do?
3. Tested – test knowledge in particular field of interest
4. Inventoried.

(5) 'Values' – motivation
Gordon: Survey of Personal Values

Scale	Personal values	Inter-personal values
	Practical Mindedness	Support
	Achievement	Conformity
	Variety	Recognition
	Decisiveness	Independence
	Orderliness	Benevolence
	Goal orientation	Leadership

⑥ Personality

Projective

Self-Report

Objective

Tests i) Cattell
ii) Gilford
iii) Cattell - 2nd order factors
iv) Eysenck EPI

Personality and other psychological tests vs Personal interview + experience

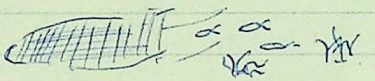
---

29/11/73

Fishing Industry

Area: North Sea - Dogger bank Lowestoft

Problem: Dogger bank itch.

- Rash related to contact with a 'Seaweed'
- Claims for industrial dermatitis highest in Summer
- Otter trawl 
- Seaweed drawn up with catch on deck

Dogger bank itch — Allergic dermatitis
- Often on the face
- Flexures of the elbow
- palm of the hand

- 450 seamen examined

Patch test done i) small bits of weed
ii) solution of particular strength

Other skin conditions
1. Sea water boil
2. "Haddock" rash
3. Eczema - Friction dermatitis of wrist
4 Folliculitis

Safety of Fishing Vessels

1. Weather conditions
2. Age of vessel.
3. Type of crew (natural selection)
4. Special services at sea — Support vessels
   - health work
   - metereological reports
5. Management and industrial relations

Trawlermens Health Safety

Medicines contribution

1. Intelligence
2. Examination
   - Before entry
   - periodic
   - after illness or injury
3. Care at sea
4. Research
   - Fatigue
   - Protective clothing
   - Ca Stomach
   - Coronary heart disease

Protective clothing

1. PVC - commonly used - hardens and allows water in.
2. Rubberised smock — does not harden
   \ allows water to get in

28/11

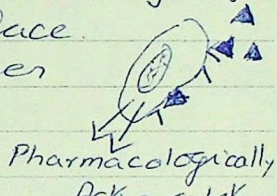
Industrial Asthma

Dr. Danes

Allergy - A specifically altered state of reactivity in the host following exposure to an allergen.

Reactions

Type I - Free antigen reacting with antibody IgE passively sensitising cell surface.
e.g. Hay Fever



Type II

Type III - Antigen and antibody reacting in antigen excess forming complexes which with complement are tissue damaging. - IgG
e.g Renal antibodies

Type IV - Sensitised cells - Tuberculin Reaction

Type I	Type III
Ig E	IgG.
Non ppting	ppting
Responsible for PK reaction in man	
Heat labile	Heat Stable
Does not use complement ab. coats cells surfaces and reacts c antigen, causing liberation of histamine and other vasoactive reacts	uses complement ab forms complexes with antigen in tissues: these are taken up by leukocytes which then liberate tissue damaging enzymes lysozyme
Immediate (Hay Fever)	Late (Farmers Lung)
Type II - 4-16 Hrs	6-36
Type IV Delayed - 48 Hrs	

① Modified Skin prick test — Type I
+ve wheal and flare reaction

② Arthus skin reaction — baggy swelling after 6 Hrs - 36 Hrs — Type III

Atopy
That form of immunological reactivity of the subject in which reagkingic antibody now identifiable as IgE antibody is readily produced in response to ordinary exposure to the common allergens of the subjects environment

Need to determine atopics in a selected population.
e.g. In study of factory exposure to Bacillus subtilis enzymes — atopic people had greater % of the skin tests and the ventilatory disease.

Extrinsic non-atopic Asthma

Asthma: A clinical syndrome characterised by partial obstruction of the air ways, which is reversible with time, either spontaneously or as a result of treatment.

Causes (Industrial)
1. Platinum
2. Piperazine — anthelmintics
— phenothiazines
3. Ampicillin & its precursor substances
4. Western Red cedar wood dust.
5. Flour
6. Sodium Chromoglycate (Intal) used in pre-treatment

Industrial Vapours

1. Soldering flux. - active constituent
   Amino ethyl ethanolamine.
2. TDI in polyurethane foam
3.

Drug Rx
1. Intal (Sodium chromoglycate)
2. Beclomethasone dipropionate (aerosol)

Farmer's Asthma - due to mouldy corn.

28/11

Immunology of Occupational Lung Disease

Spectrum

1. Asthma.
2. Extrinsic allergic Alveolitis < Granulomata / Fibrosis - e.g organic dusts
3. Fibrosing Alveolitis - e.g Asbestos or inorganic dusts
4. Dust Deposition. e.g. Coal deposits.
5. Pulmonary and Systemic Granulomata e.g Berrylium (Type IV)

Immunology and Occupation

(1) Asthma

Host	Pathology		Agents
(2) Specific IgG	Extrinsic Allergic Alveolitis	- specific antigen - Good challenge - No skin test	Organic dusts esp saprophyt. Thermophilic microorgan. Micropolyspora faeni - farmers
		good chalenge — Skin test - late reaction	Aspergillus clavatus - Malt workers
			? Thermophilic actinomycetes Mushroom workers
			Coniosporium Maple bark.
		No skin reaction —	Mouldy bagasse - Sugar cane. - Thermo actinomyces sacchari.
			Sitophilus granarius wheat handler etc.
			Pigeons / Budgies / Poultry > Avian - Protein hypersensitiv. - Bird fanciers Lung

Inhalation Challenge

Type I

Bronchial

Immediate increase of airway resistance ± or ± out clinical asthma

Type III

Systemic after 4-6 Hrs ± fever, limb pain and leucocytosis

Alveolar response

Breathlessness after 4-6 Hrs with decreased lung compliance and fall of DLCO ± or ± out radiographic pulmonary infiltration.

Bronchial

Increased airway resistance after 4-6 Hrs ± or ± out clinical asthma.

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(3)

Host	Pathology	Agents
Nil	Non fibrogenic dust deposition	Inorganic dusts Iron - Siderosis Tin - Stannosis Coal - Simple pneumoconiosis

Autoantibodies
IgM - Rheumatoid Factors — P.M.F Necrobiotic Nodules — Coal - Caplan's Syndrome (Anti lung antibodies — ppn test)

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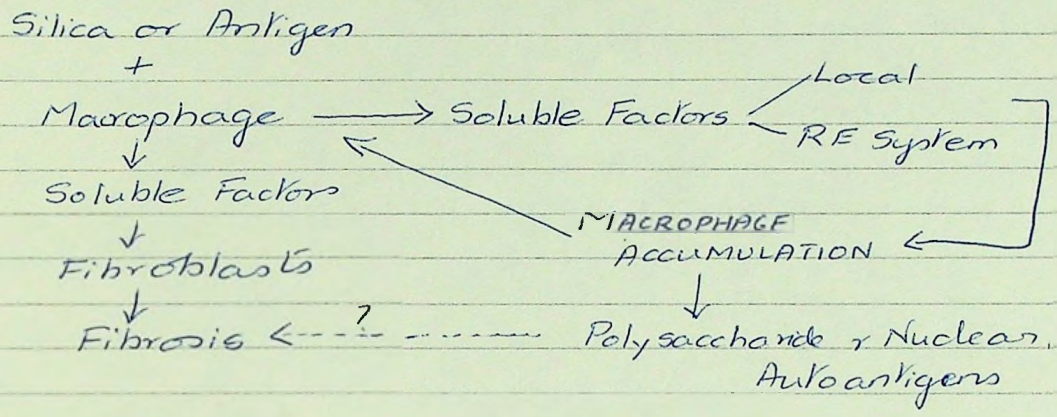
(4)

Auto antibodies IgM ± IgG Antinuclear antibodies Rheumatoid Factor.	Fibrosing alveolitis and Fibrotic nodules.	Inorganic dusts Silica - SiO_2 Asbestos - Hydrated $CaMg_3Si_4O_{11}$ Talc - Hydrous $MgSiO_4$ Mica - Complex $MgSiO_4$

Pathogenesis of Fibrotic nodules in Silicosis



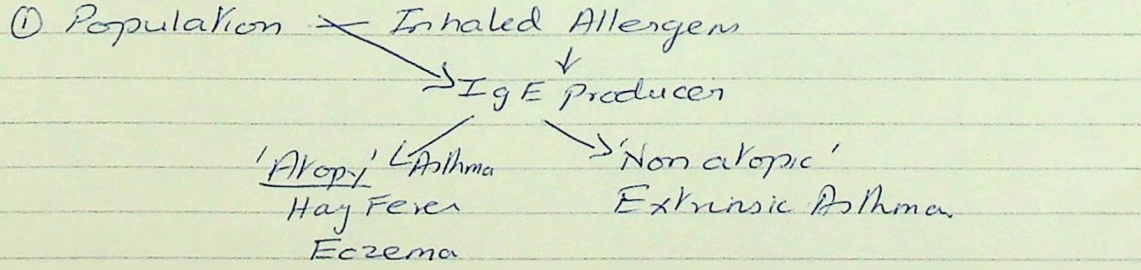
(5)	Host	Pathology	Agents
	? Lymphocyte Sensitization	Pulmonary Granulomata	Beryllium

The Host in Occupational Lung disease

His facility perhaps genetically determined to produce:

- Reagen IgE
- Precipitating IgG antibodies
- Non-organ specific IgM and IgG autoantibodies
- Rheumatoid factor, antinuclear antibody
- Anti Collagen antibody.

An idea of Host responsiveness in some lung disease

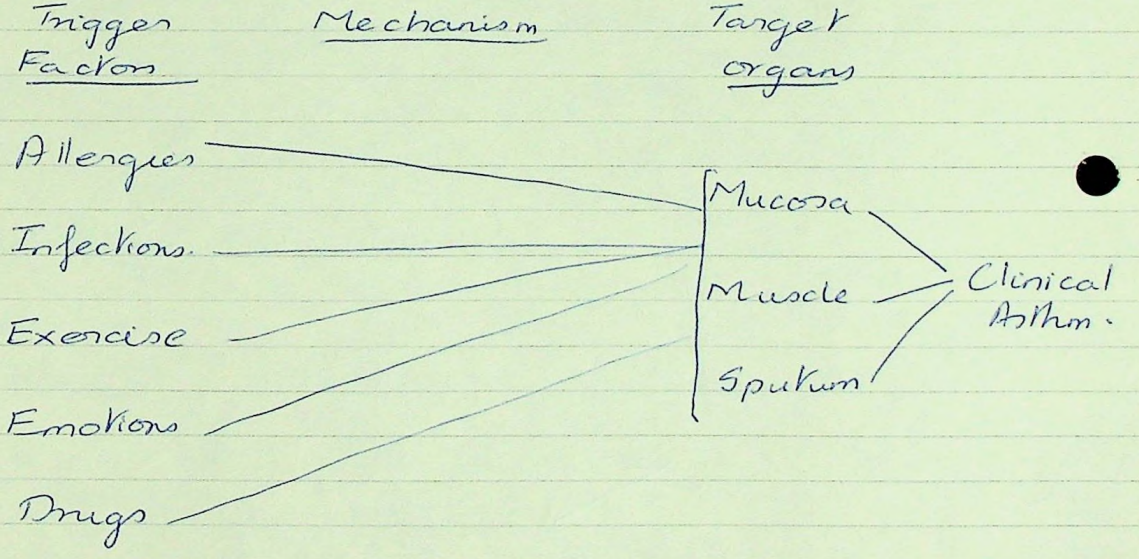


inhaled allergen
↓
② Population ------> Precipitins
↓
Extrinsic Allergic Alveolitis

③ Population → Trigger Factors ? Virus
↓
Tissue antibody producers
↓
Systemic auto allergic diseases
&
Fibrosing Alveolitis

↓
Lone fibrosing Alveolitis

Asthma

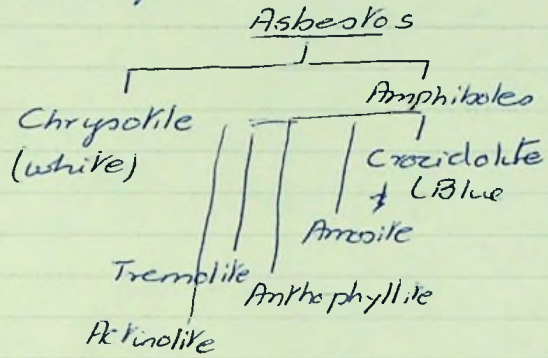


11/12/73

ASBESTOSIS

Dr M.L. Newhouse

- Fibrous mineral silicate
- Classification



Modern use from 1890
- Development of mines in SA & Canada

2000-2500 different products

Sources
i) Chrysotile – Canada, USSR, SA, USA others
ii) Crocidolite, Amosite – SA.
iii) Anthophyllite – Finland

Used – USSR, USA.

Carcinogenic effect ± smoking

Xray
1. Pleural plaques – holly pattern
2. Cā Bronchus
3. Mesothelioma
   Other tumors implicated
4. Cā – large bowel
5. Cā. larynx

Asbestos fibres/c.c averaged over 3 month (1969)

Dust category

Negligible	< 0·5
Low	0·5 to 2
Medium	2 to 10
High	> 10

(Gilson 1973)

Carcinogenecity factor (Wagner, Berry Timberell, 1973)

Crocidolite	1·45
Amosite	0·66
Chrysotile (Canadian)	0·50
" (Rhodesia)	0·44
Anthophyllite	0·33

Asbestos bodies — in HPR.
— index of exposure and not of disease

11/12/73

Management of Asbestos hazard in a Factory

1. History of Factory.
2. Type of product

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3. Processes

Raw material packed in special impermeable bags

a) Feeding of Hopper
b) Pressing into sheets (wet process)
c) Moulding of asbestos cement products
d) Sanding of product. (dry process)
e) Weaving of asbestos textiles (3-5% overall prodn) (dry process)
f) Friction material manf e.g. brake lining
   - mechanical pressing
   - Sawing of sheets, drilling (dust levels ↑)

Ref: Lynch et al American Industrial Hygiene Association Journal 31(5) 598-604 Sept Oct 1970

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4. Measurement of Dust or Fibre in environment

Fibre - aspect ratio 3L/1B

OBZ - operator's breathing zone

Casella personal sampler.

5. Medical Records & examinations

Occup. Hist: 1) List of occupations since School

Bar to Employment on History

1. Previous work in Dust hazard
   - Coal Mining
   - Stone Quarrying
2. Disability due to Pneumoconiosis
   - Silicosis
   - Berylliosis
3. Other diseases leading to interstitial fibrosis or lung disease

Phys. exam^n

1. Nasal obstn
2. Gross phys. Deformity of Chest
3. Bronchitis, Bronchiectasis, Emphysema.
4. Gross Hypertension
5. Cardiac insufficiency
6. Gross Rheum arthritis – Caplans possible

Certificate of Med exam^n

Identification +

1. Unfit for employment.
2. Fit for " in any dept
3. Fit for " only in dept for which engaged
4. Unfit for employment in scheduled areas
5. Unfit for employment demanding visual acuity
6. Employed subject to xray
7. Fit only for light work

Asbestos Research Council
Info Section
114 Park Street
London W1

Δ of Asbestosis (Table)

Early Cases (Tripod)

1. History
2. Clinical
3. xray.
4. Lung Function.

Reexam^{n} & xray every 1-2 yrs.

History 1. S.O.B
2. Cough & sputum

Phys. signs

1. Basal rales - (end inspiratory) - below nipple and gradually spreading to back (L of scapula)
2. Clubbing of fingers

---

3 Types of people — 1. Cases
2. Suspects
3. Candidates

11/12

Pulmonary Evaluation

Asbestosis

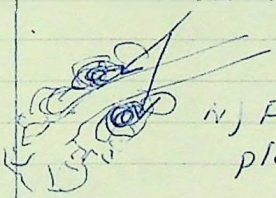
1. Cor Pulmonale
2. Carcinoma i) Bronchus
   ii) Alveoli
3. Mesothelioma.

Chrysotile fibre less dangerous :
- does not penetrate as much
- more soluble

Pathology

i) Fibres lie in longitudinal axis of bronchioles - some reach alveoli

ii) Fibrosis begins in alveoli lying adjacent to terminal bronchioles Later spreads to alveoli.



iii) Lower lobes affected

iv) Fibrosis and calcification in the pleura.

Radiology

1. Bilateral pleural thickening or plaques - pathognomonic

Other Signs — Classification.

Clinical Symptoms

1. S.O.B even at rest
2. Cyanosis $P_{O_2}\downarrow$
3. P_{CO_2} normal or $\downarrow$
4. Clubbing of fingers — $\angle$ measured.
5. Basal crepts:
   dry - end inspiratory

11/12

Case Demonstration

Clinical Presentation

1. S.O.B - progressively increasing
2. very little cough ± sputum
3. Loss of wt ± lassitude.

Signs

1. Rales at bases - end inspiratory, bilateral. Fine, dry.
2. Clubbing. (50% of cases)
3. Asbestos in sputum (only sign of exposure)
4. Asbestos corns - fingers, between toes and face

Xrays

1. Hazy appearance
2. Increased striations
3. Shaggy heart
4. Pleural plaques

Parasitology - Revision

1. E.h. Trophozoites (hematophagus) in gut.
2. P. falciparum - Tenue form ?band.
3. Amastigotes in tissue
4. Promastigotes in culture
5. Giardia lamblia
6. Morula cell. - T. brucei - perivascular cuffing
7. Schizont in the liver.
8. Schizont of Pl. malariae (Rosette)
9. Amastigotes
10. Trypanosoma brucei
11. Malaria pigment in live
12. Cyst of E.h.
13. B.coli in gut.
14. Babesia - non human malaria
15. Amastigotes in bone marrow
16. Microgametocyte of P. falciparum
17. P. malariae (bird's eye)
18. Amastigotes
19. Sporozoite of plasmodium.
20. T. lewisi - non-human parasite

=

3/12

Small Factories: Group Health Services

Dr. W.T. Jones

Total factories - 250,000
80% employ under 500 people. → Total Served
3 million

4/12

Occupational Dermatitis

Positive patch test
↓
Antibodies present — Cause of Dermatitis
Effect of Dermatitis
unconnected finding.

Patch Test - Aluminum foil & pure cellulose paper
- Kept on for 48 Hrs - I^st Reading.
II^nd reading after another 48 Hrs

4/12

Mental Fatigue & Hours of Work

Studies

1. On pilots in aircraft simulating machines (↓ of experience of bomber pilots during the war)
2. Time of patrol against number of submarine sightings

Fatigue effects & patrol time

Tolerance of error
Breakdown of skill

Types of Jobs

I – Specialist – Pilots.

II – Vigilance jobs – checking products on conveyor belt.

Method of Testing Vigilance –

1. "Vigilance decrement function"

3 minute period of test.

Prevention of fall in function by Rest Pause

1. Intervening periods of rest (half hour intervals)
2. Stimulant drugs – Benzedrine.
3. Effect of knowledge of results – Feedback
4. Motivation – arousing people to perform well.

Vigilance decrement enhanced by

1. Alcohol
2. Antihistamines or tranquillisers – Meclozine, Hyoscine
3. High atmospheric temperatures

4. Lack of sleep.

An important finding of some of these studies was Detection rate ∝ Probability of fault.
∴ Detection rate will fall ∴ improving batch quality
Probability, not frequency affects efficiency.

– Corelation of detection efficiency and unsociability,

—

Efficiency during one hours simple inspection of group 'speed'
1. Paced work – afternoon better than morning work
2. " 'Accuracy' "

—

Circadian rhythm
1. Body Temperature – rises from 6 AM (sleep ends) peak at 9 P.M, then falling.

Rotating 3 shift system (4 Hour spells)

Percent signal detected Response time Calculation Rate	All three corelated very well with Temp. rhythm

Night shift – Flattening of rhythm seen in men on shift system for many years
– Some 'adaptation' long term

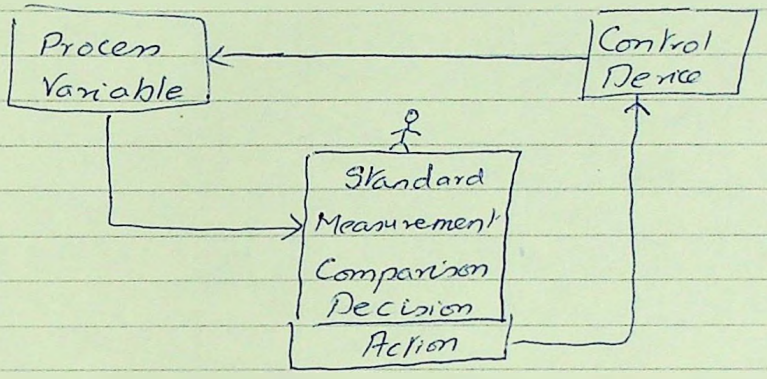
Visit to London Tpt

Victoria Control Room
Line

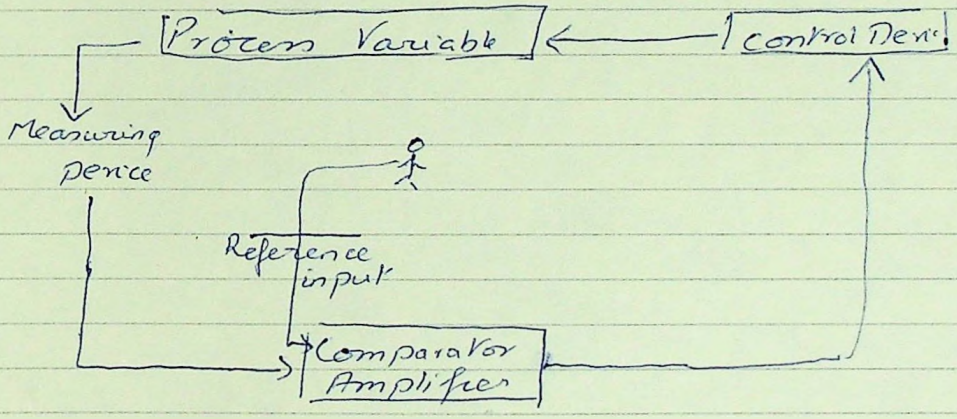
7/12 Ergonomics: Applied Psychology

Implications of automation on human beings

(1)



(2)



(3) Problems of automation

1. Removal of skills.
2. Job enlargement – enrichment.
3. Boredom

Boredom - Welford's four critical speeds of signal presentation

(1) Very fast rate – operator shows signs of strain
(2) Slower rate - strain absent – interest maintained.
(3) Still slower rate operator bored and unwilling to do task.
(4) Very slow rate - Tolerable – operator does something else

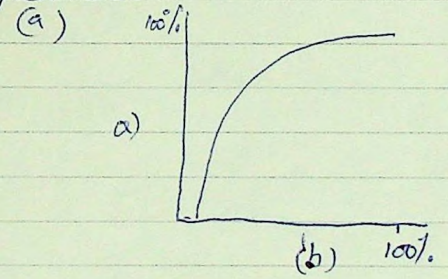
No completely self sufficient automation — always human monitor required

(4) Isolation ⟶ loneliness
↘ reduces power of decision taking.

(5) Vigilance (i) ⟶ Role of Ergonomics
↗ variability of work load

Monitor — necessary.
— but man is a poor monitor
↓
concentration wanders. unless continous arousal.

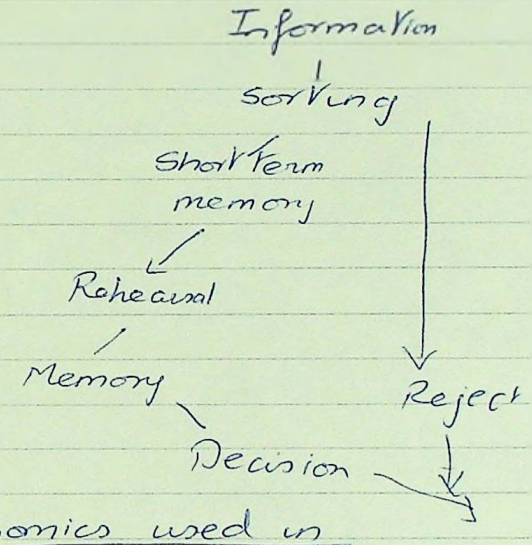
Studies
i) Proportion of faults vs proportion of false alarms reported



(ii) Variability of work load — modified by ergonomic techniques
a) — presentation of panel information and circuits.

(6) Reduction in man-power
— Retrenchment — Redundancy

Mechanistic Diagram of Brain function



Ergonomics used in
i) Sorting of information
ii) Presentation of "
iii) Action communication

—

WHO - Ergonomics

'Teaching men and machine to work comfortably together.'

—

13/12

Vibration Syndrome

Maurice Raynaud (1862)
'Symmetrical blanching of fingers'

Occupations

1.
2. The chain-saw operator
3. grinders
4. hand grinders

Onset of symptom – depends on
i) type & dose of vibration
ii) duration of exposure.

Symptoms

1. Swelling of fingers at the end of day
2. Sudden attacks of numbness and tingling (often at night)
3. Blanching of fingers (in attacks)
   - fingers affected depends on type of work usually middle & ring
   - starts from tip and extends proximally
   - paraesthesia – no sensation – desensitized can get injuries and burns
4. Bone cysts – synovial fluid extrusions rather than blood interferences

Recent evidence: condition not commoner than in manual workers (not using vibratory tools)

Pathology

1. Media of vessels – muscle tissue increased – later fibrous tissue proliferates
2. Round cell infiltration around nerve bundles
3. Callous formation' theory of Alice Stuart not tenable.
5. Cyanosis – next stage after blanching
   – as a c small areas of necrosis on the tips of the fingers –

Pathophysiology

1. Blanching — - Spasm of peripheral vessels.
   - absence of ↓ in the fingers. (or reduced)
2. When hand in cold water — normally,
   i) first uncomfortable feeling due to spasm
   ii) Peripheral reflex vasodilatation - leading to warming of hands
   (ii) is delayed in Raynaud's

3. Vibration
   i) Initially increases blood flow — Swelling of fingers
   ii) Later hypersensitivity of vessel musculature
   — blanching (spasm)
   iii) Later thrombosis + fibrosis ⟶ Cyanosis + necrotic areas (Terminal gangrene)

— Changes in condition of blood vessels have been studied by Arteriogram.

Causes of Vibration

Range — 4 — 2000 (Hz)
Most important level is 125

Hand - 30-80
Resonance f. of fingers is 125

Other criteria
i) amplitude
ii) acceleration - now used

—

Smoking may decrease latent period

Methods to reduce vibration
1. anti vibration pads
2. anchor vibrating tool.
3. Remote control pressure application.
4. Isolation

—

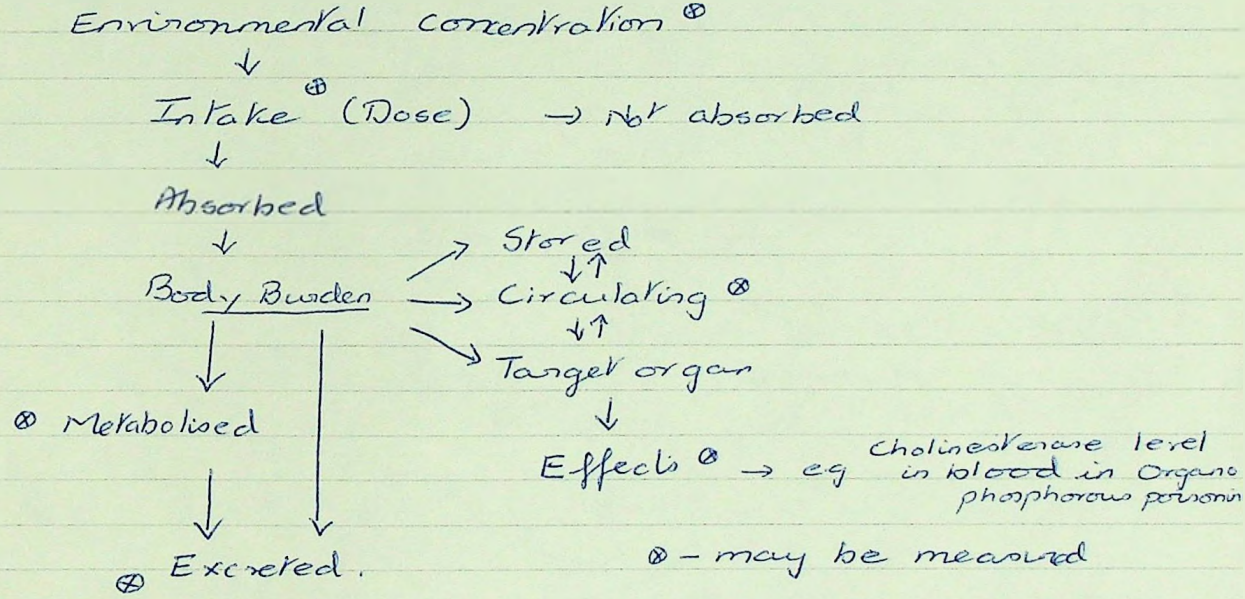
13/12

Environmental Sampling

Why

1. Assess exposure
2. Evaluate preventive measures taken.

What



Biological half time - Determined by rates of metabolism and rate of excretion of the substance.
- Time taken to reduce the body burden of the substance by a half.

e.g H_2S - 1 hr

SiO_2 - 1 yr +

Why

General reasons for sampling

1. Overall efficiency of plant
2. Sterility of atmosphere
3. Fire hazard

Why?

Medical reasons

1. Excretions of absorbed substance

a) Urine – Tritium
b) Breath – alcohol, benzene
   Soon after exposure

2. Body fluids

a) Plasma e.g. – Blood lead
b) Whole blood –
   – may not represent tissue levels.
   – in encephalopathy – plasma lead level is useful measure
   – whole blood – gives general exposure level.

3. Biological effects

a) Levels of enzymes in blood – increased or decreased by substance

4 Environmental sampling ⟶ relation to 1–3.

a) Threshold limit value
b) Time weighted average

) Length of sampling depends on nature of substance – its half time

How long:

i) quick exposure – short period between samples
ii) long half life – long periods between "

Acceptable mean is lower if marked fluctuations in atmospheric values.

14/12 TOXICOLOGY - REVISION Dr Owen

PHYSICAL

1. Accidents.
2. Noise/Vibration.
3. Heat — burns,
4. Cold
5. Ionising radiation — Open / Closed
6. Environmental
   - Lighting.
   - Ventilation
7. UV + IR
8. Decompression — Divers, Tunneling.
9. Explosion (Compression)
10. Entombment
11. Electricity
12. Lasers
13. Effects of repetitive motion & chronic pressure effect

COTVLDS

Pneumonic? For first few sections of Factory's Act

14.

CHEMICALS

1. Gases
2. Vapours
3. Liquids
4. Solids — Fume / Dust

By effects

1. Irritant
2. Corrosive
3. Carcinogenesis

Toxicology of a Chemical Hazard

1. Substance — Element & Compounds — Inorganic / Organic
2. Processes
   - i) Extraction
   - ii) Manufacture
   - iii) Use.
3. Physical state

4. Route(s) of entry.
5. Metabolism & Detoxication
6. Routes of excretion
7. Medical aspects
   i) History → occupational
                → medical
   ] Past & present
   ii) Clinical examination
   iii) Special Tests ⊗
   iv) Follow up.
   v) Post-mortem
8. Supporting evidence
   i) Environmental
   ii) Epidemiological
   iii) Animal expts.

⊗
Special Tests
1. Radiology
2. Haematology.
3. Biochemistry
4. Lung function
5. Audiometry.
6. Opthalmology.
7. Skin Biopsy
8. Sputum
9. Exfoliative cytology
10. Skin Testing.
11. ECG

9. Diagnosis
10. Differential diagnosis
11. Prognosis.
12. Complicating Factor
13. Treatment
14. Prevention — General / Specific
15. Statistics
16. Legal Aspects — State — Notif. / Precr
                  \ Civil
17. TLV & monitoring

INDUSTRY

I - Pottery

Processes
- Clay
- Glazes
- Colours
  - Metallic
  - Organic

Hazards
- Phy - Machinery, Heat from kilns, Heavy w/s
- Chem - Dust - silicate (Siliceous), Toxic metals

II Ship yard

- Steel
- Lead paint
- Asbestos
- Welding
- Noise - Riveters
- Divers
- Foam plastics
- Solvents
- Resins
- Mercury, Arsenic (Anti fouling paints)

- Sweating a rail stack - Nitrous gassing
- Refrigerants
- Cargoes
- Boiler scalers
- Vanadium oxide
- Wood dust + splinters

WELDERS – Physical

1. Arc Eye
2. Spark damage – burns
3. Penetrating injuries
4. Electrocution
5. Burns
6. Explosion
7. Radiation hazard

Chemical

1. Metal fume fever
2. Nitrous oxide
3. Ozone
4. Phosgene, Co
5. Coating on welding rods
6. Flux – Fluorides

Printing

1. Paper
2. Inks – solvents
3. dyes
4. Lead
5. oil – mineral or carbon black
6. Water → bacteria
7. Anti set-off spray
8. Effects of odd shift hours

INDUSTRIES

Productive

1. Mining
2. Forestry
3. Agriculture
4. Fishery.
5. Oil

Manufacturing – Oil
Electricity
Transport – Air
Sea
Land – Road
Rail

Steel
Chemical
Food
Plastic

Administrative

1. Administrative – Govt
LA
2. Police
3. Armed Forces – Army
Navy
Air Force
4. Prisons
5. Hosp.
6. Academic

Service – Transport services
Post office
BBC
Printing – News

Home

AHS - Authority for Health & Safety

MANAGEMENT - III

Dr. C.M.S. Coppin
Slough I.H.S.

18/12

Budgeting and Expenditure Control

Salaries

1. Professional and non-professional staff
2. 75-80% of total budget
3. Annual increase 8-10%
4. Superannuation + National insurance contribution.

Expenditure

1. General day to day running 25%.
2. Includes
   i) Medical supplies - drugs, dressings, syringes, needles
   ii) Maintenance (may be fixed and allotted by company)
   iii) Rents — may be given 'free' by company.
   iv) Rates — Taxes raised by local authority
   v) Insurance
   vi) Postage/Telephone
   vii) Stationary.
   viii) Energy - Electricity, heating, gas, water
   ix) Laundry.
   x) Cleaning.
   xi) Transport.
3. In addition the following should be built in to the budget
   i) Capital investment. e.g X-ray machine
   (replacement) ECG
   Short wave Diathermy
   Audiometer.
   ii) Contingency allowance - 10% of total general expd.

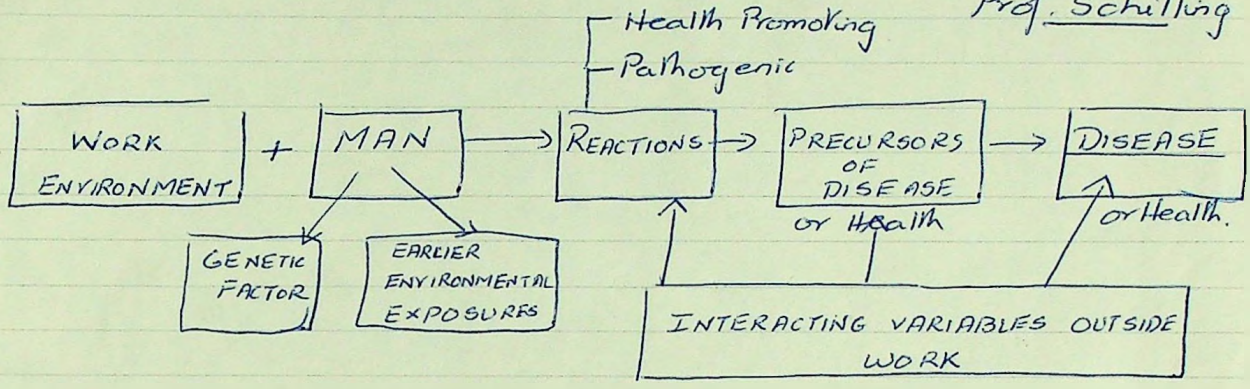
Budget Control

1. Regular review of income and expenditure every 3 months
2. Vigilance on day to day expenditure.
3. Shopping around. – research for advantageous prices.
4. Access to sound financial advice

18/12

Monitoring Health Needs in a Factory

Prof. Schilling



Monitoring - Latin word - 'to advice' or 'to warn'

Two aspects

1. Routine observations on people and environment.
2. Analysis of data – preventive measures and evaluation.

Types

1. Work processes
2. Environmental
3. Health surveillance

Looking for –

Early warning of health impairment.

WHO - Expert Committee - Report - Why Monitor?

(1) Assess recognised occupational health risks to evaluate their control.

a) Recognise hazard
b) Continue monitoring people, work environment
c) Use monitored information epidemiologically to evaluate preventive measures

(2) To identify occupation health risks not previously recognised

(3) To identify other sources of health risks associated stresses at work which do not cause O.D. but create psychobiological vulnerability to other known diseases

(4) To identify work factors that play a role in the promotion of health.

(5) To provide information of C.H problems through observation of groups of gainfully employed.

(6) To evaluate the OHS provided
   i) How it is used?
   ii) What does population think of it?

Monitoring
1. Biological
2. Environmental
3. Statistical – national
   – regional
   – industrial

19/12

Protective Clothing

- Heat Balance Equation

$$M - W = \text{Evaporation} + \text{Radiation} + \text{Conduction} + K + S$$

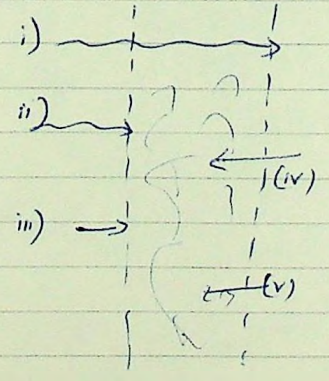
- Ways of Heat passage through a thick fibre

Fibres stabilise layer of air around the body

i) Direct penetration of assembly by radiant heat
e.g pullover

ii) Absorption of radiant heat on surface of assembly

iii) Re-radiation from hot outer fabric to cooler formed plastic and backing fibre



iv) Heat transferred by convection conduction and radiation

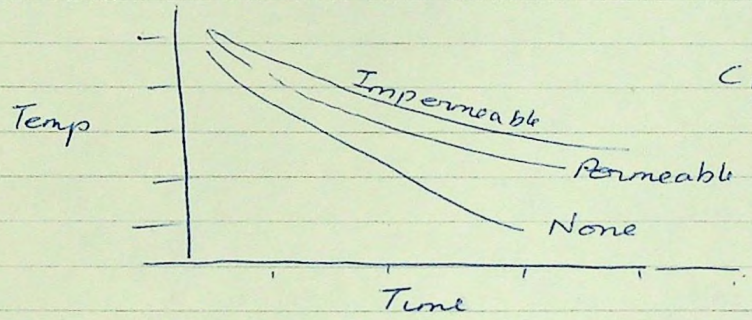
v) Heat reduced by

Clothing i) Effective in reducing sweating when person sedentary

ii) At work – interfere ē sweating

Effect of wind

1. Erodes outer layer.
2. Erodes stabilised layer
3. Can produce drafts in between layer
4. Can press on – collapsing clothing on surface of body.



Clothing – (cooling chart)

5. Wind has a much more cooling effect on a wet surface than a dry surface

Density of fibre (wool fabric) ∝ conductivity

i) Limit to clothing – 1 inch. (Practical)

ii) Clothing requirements become much more critical at low metabolic rate

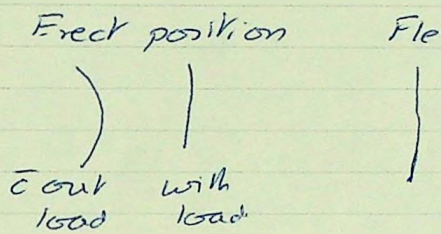
Important aspect of clothing – ability to let in and let out air and facilitate evaporation of sweat.

20/12

Occupational lesions of the skeleton

1. Derangements of spine

Effect of load carrying on normal lumbar spine



i) Extension
ii) Flexion films] Lat spine

a) - narrowing disc L4-L5

b) — myelography - hyperextend spine
disc pops out.

c) sacralization of sacroiliac jt c L4-L5
5% of people.

d) 'Traction spurs' -- not osteophytes
because removed from articular surface
— usually assoc c instability - seen
in extension & flexion films

e) narrowed intervertebral discs in
neck.

2. Stress fractures — rhythmically repeated
subclinical stresses
i) Ballet dancers — defects of neural arch

ii) Individuals who work on hands and knees
- miners, carpet layers

iii) children – 'at' injury rugby.
iv) Athletics – 'Shin splints' or 'split shin'
v) Ballet dancer – Brigadoon legs
'Iatrogenic horror' – amputation for stress # callus thought to be sarcoma
vi) March # of soldiers
vii) Foot levers can produce (vi)
viii) Irregularity of symphysis pubis (seen in 'flamingo' views) in athletes → Pain in groin (sacroiliac jt)
ix) Avulsion injuries – fencers, athletes – professional footballers

3. Injury due Vs muscle spasm

i) Electric shock – occupational
– epileptics
– ECT in psychiatry.

a) Post-dislocation of shoulder – shock while putting up lights
b) Free-collapse vertebra

4. Stress injuries
1. Occupational
2. Minor trauma

a) Heberdeen Nodes of osteoarthritis
b) Osteoarthritic changes in various bones

Industrial Fatigue

Maxcy
Chapter 34

Work & Fatigue

Industrial fatigue → decrease in output of work
→ conscious sensation of tiredness
→ both resulting from preceding work

Nature of fatigue

1. Biochemical factors
   - no measurable changes
2. Physiological factors
   i) repeated nerve pathway use.
   ii) muscular fatigue due to posture.
   iii) constant use of eyes – eye fatigue
   iv) Changes in circulation / water & salt balance when working at high temperatures
   v) Changes in body resulting from high pressures of nitrogen
   vi) changes in ear - noise
3. Psychological factors
   i) Boredom
   ii) fear] — over home/work conditions
   iii) worry]
   iv) monotony of work
   v) Skill & attention beyond capacity of worker
   vi) mental activity - continuous or hyper.
   vii) constant hurry
   viii) Pressures of modern work
   ix) adjustment to different personalities
   x) Feeling of responsibility
   xi) Fear of failure
   xii) Job insecurity
   ] Emotional stresses
4. Economic factor
5. Social factor – esp congeniality of work group

Reference
Maxy-
Chapter 33

Health Problems of Women in Industry

1. Numbers
2. Distribution by occupational and industrial group

Ref. India 1976 annual

3 Health problems associated with anatomical differences and physiological processes.

a) Effect of Work on Pregnancy
   i) Course of pregnancy
   ii) diseases of "
   iii) incidence of spontaneous abortions
   iv) Premature birth
   v) Infant death rates

Inconclusive evidence but safe first 6 mths of pregnancy Last trimester??

b) Pregnancy + restrictions on work
No employment in jobs requiring
   i) heavy lifting
   ii) constant standing
   iii) constant moving
   iv) good balance
   v) exposure to dangerous concentrations of toxic chemical substances
   - lead - Hg, CCl_4 - ionising radiations
   - which effect fetus or course of pregnancy
   vi) Preferably 40 Hr/wk.

c) Maternity leave - 6 wks prior + - 6 wks postnatal.
- no dismissal

d) Relation of work to Menstruation + Problem of Dysmenorrhoea
   i) Time loss - variable
   ii) excuse for other absences

iii) Exposure to toxic chemicals
heavy muscular work
constant reaching/skeletal
vibration

- all reported to aggravate menstrual and gynecological conditions → inconclusive evidence

iv) Menopausal changes - irritability has no effect - infact work is therapeutic.

e) Abilities in work

Manual dexterity
Fine coordination
} Better than men

Muscular work
lifting heavy weights
pushing/pulling loads
Grip
} less than men

Fatigue - usually less than men but often more because of additional household duties

f) Anatomical differences - resulting in ergonomical problems because machinery is built on male anatomical scales.

g) Occupational diseases - non-pregnant ♀ same extent affected as ♂
- pregnancy → effect on fetus
→ more susceptible

h) Accidents - Women have lower rate of industrial accidents
- lower fatal accidents
- higher non-industrial accidents

ST. JOHN'S MEDICAL COLLEGE, BANGALORE

Class	Roll No.
Semester	Subject
Examination	Date

Preventive Medicine – Periodic Health Examination
Mass Screening Techniques
Immunization Programmes

Preventive Medicine

Object: To 'oppose' or intercept the disease process in man or community.
- can be done at various levels in the course of the natural history of disease.

Levels
1 Health Promotion] Primary Prevention
2 Specific Protection]

3. Early Diagnosis and Treatment] Secondary Prevention

4. Disability Limitation] Tertiary Prevention
5 Rehabilitation]

① Health Promotion
Improves general health and well being of the individual or community.
i) Adequate nutrition
ii) Provision of a sanitary environment
iii) Personal Hygiene.
iv) Health Education → Attention to Personality development
v) Sex education.
vi) Marriage counselling.
vii) Physical education.
viii) Periodic Health Screening. → (Imp. method).
ix) Improvement of Std of Living.
x) Genetic counselling

② Specific Protection – to avoid specific disease

Ref - i) Leavell & Clark
ii) WHO Chronicle 22.473
iii) PHP No 34

i) Specific immunization – DPT, TABC, BCG
ii) Specific nutrients – enriched or fortified foods, iodised salt fluorinated water.
iii) Protection against occupational hazards – masks, gloves, respirator ear plugs.
iv) Protection against accidents – helmets.
v) Protection against carcinogens – lead aprons for xray workers and (iii)
vi) Protection against allergens
vii) use of ~~ert~~ Sanitation – (iii)
viii) Attention to personal hygiene
ix) Suppressive drugs a) INH in children b) Antimalarials

(3) Early diagnosis and Rx
'Stamping out the spark instead of waiting for the fire'
– Important in TB, Leprosy, CVS diseases, Cancer, VD (to prevent complications for individual.
– Important in epidemic diseases for community (to prevent spread)

i) Case finding measures – individual and mass
ii) Screening surveys ⟶ (Imp) e.g. V.D
iii) Surveillance techniques
iv) Selective examinations

(4) Disability Limitation – Early and adequate treatment to prevent complications, prevent death.
i) splinting in rheumatoid arthritis
ii) protection of anaesthetized fingers in leprosy etc.

(5) Rehabilitation – Subject of Prof's Lecture

① Preliminary, Periodic or Routine Medical Examinations

Types

1. Annual / Periodic Medical check ups — voluntary / statutory
2. Preplacement examination.
3. Routine medical check up - voluntary.
4. Selective placement examination

Character.

1. Doctor-patient relationship not fully established
2. Medicolegal / Ethical rules about disclosure of information may not always apply e.g. for life insurance
3. 'Full standard medical' becomes mechanical. - clinical acumen is often blunted.

Objectives vary

1. Pre-employment.
2. Job placement.
3. Routine health checks — to ensure that person fit for work. / to detect whether work has had any adverse effect.
4. Post sickness absence.
5. Pre-retirement.
6. Periodic for Specific occupations.

Pre-employment

1. To ensure that the subject is fit to undertake the job without risk to himself / his colleagues / general public.
   - epilepsy
   - anemia in Pb industry
   - tuberculosis
   - typhoid carrier.
2. To find out his physical and mental abilities / to fit him into different jobs
3. Whether subject is an acceptable life or disablement risk to pension fund (wherever applicable)

Consists of

- Medical History
- Family History
- Social History
- Occupational History

Phys. exam

Lab Inv-
- X ray
- blood & urine
- ECG
- Vision etc.

Hazard	undesirable condition
Lead	Anemia, Hypertension, Nephritis
Dyes	Asthma, skin diseases, bladder & hardcancy disc.
Solvents	Liver & Kidney disease. Dermatitis, Alcoholism
Silica	Healed or active TB. Chronic lung disease
Radium & X rays	— Blood disease.

After Sickness – not practicable for short spells of sickness but for long ones (15 day – month – more)

Objective i) ? person fit to return to work.
ii) ? those not fit to be resettled temporarily or permanently.
iii) those permanently unfit for alternate work

Periodic

i) For drivers of heavy vehicles – risk to public.
ii) For occupational exposures
Pb/toxic dyes/radium — monthly
dichromates — daily
iii) For senior executives — risk to indiv/company

Procedures
1. Proformas – used by doctor
2. Self administered questionaire
3. Team work – doctor/nurse.
4. Investigations
i) Screening
ii) ECG.
iii) Skin tests for allergies
iv) Biological monitoring
v) Audiometry
vi) Vision testing

(3)

Immunization Programmes

1. Points to considered – general
– vaccine.
2. Immunization schedules – developing
– developed countries
3. Cost benefit. cost effective studies
and how to decrease cost.
4. Evaluation

(2) Screening - very important 'growing point' in medicine

Defn - process of 'sorting through' a group or population to identify a relatively small number with a certain characteristic.

e.g. mass chest x rays for TB.
Air force recruits for colour blindness
urban community for glycosuria

Search for unrecognised disease by means of rapidly applied tests — "Iceberg"

Objectives

Apparently Healthy (Screening Test)

Apparently Normal	Apparently Abnormal
↓	↓
Periodic (Rescreening)	Further inv
	a) Normal - periodic rescreening
	b) Intermediate - Surveillance
	c) Abnormal - Treatment

Disadv

N.B - i) guard against producing anxiety and invalidism in otherwise apparently healthy people

ii) Little point in detecting early disease if nothing can be done to stem progress

Types

Purpose

A i) Protecting public health e.g. food handler

ii) screening of population e.g. diabetes for research

iii) 'prescriptive' screening for early Δ and R,

B i) Mass screening ←→ Well person screening - MMR for TB

Methodology

ii) Selective screening — Pregnant women — Rh, Toxaemia

age group — newborns - phenylketonuria

occupation — aniline dye workers - bladder cancer

cotton workers - byssinosis

Scope

iii) Single disease screening — TB, Phenylketonuria

iv) Multiphasic screening = cost benefit 'health' screening.

v) Automated multiphasic screen.
- using modern data handling technology.
computers - self recording automatic or semi 'automatic device
- reduces cost and manpower - increases efficiency

'biochemical' or 'diagnostic' profile — battery of tests on visit to outpatients.

In U.K — 17 items (BUPA Lab).

Blood biochemistry. + ECG + Ht, Wt, Skinfold thickness, lung function, hearing vision, bp, urine for sugar (9)

glucose, urea, uric acid. (18)
creatinine, inorganic PO4
calcium, alkaline Phosphatase.
bilirubin, serum glutamic GOT acid
albumin, globulin, serum iron, Na, K, Cholesterol, B lipoprotein
Total lipids

Haematology - CBC, PPC r absolute values. ESR, Film

♀ - Cervical smear, high vag. swab, pelvic exam
Breasts examined clinically, and thermographically

Criteria of the Screening Test

The Test

i) capable to be applied to large (Simple) (Repeatable) numbers
ii) Reliable - free from observer variation
iii) Specific - few false +ves
iv) Sensitive - few false -ves.
v) Acceptable - to the public
vi) Inexpensive.

The disease

i) latent. presymptomatic stage.
ii) relatively common. and/or serious in its consequences
iii) clearly distinguishable from normality
iv) must be reversible or controllable by Rx.

Tests

Ht r Wt - growth malnutrition
Visual acuity, colour vision, eye tonometry.
Hearing
B.P
Phenylketonuria.
Albuminuria.
Glycosuria.
Bacteruria
Tuberculin te.
MMR
ECG.
Resp. Function Tests
Blood cell count.
serological exam"
Blood cholesterol
Blood sugar
Hb
Cerv. Smear

3 groups
- Acceptable
- Insufficient evidence to justify
- Some benefit to a few at high cost

Disadvantages
"Against"

Ethics - what if no Rx exists

Scientific - Does earlier Δ alter natural history.

Financial - How much is the community prepared to pay for one life

Occupational ~~hazards~~ health prob. in agriculture

agriculture includes activities connected c̄ growing, harvesting & primary processing of all types of crops, with breeding, raising & caring of animals & with tending gardens & nurseries.

Occupational health in agriculture is a rel. new concept. it previously came under industrial health. In view of the involvement & no. of people employed
~~occupational health~~

Gen. prob met c̄ ~~are~~ & c̄ affect dis are -

1. Housing ~~& environment~~ 1. Poverty & a low std of living.. is primitive c̄ not sanitation or ventilation. There is no place for washing & bathing, no latrines & no methods for sewage disposal. waste water collects around & serves as a breeding ground for mosquitoes, flies etc.
Overcrowding facilitates droplet & contact inf.
The house is also used as a workshop & to house cattle. animal ~~excreta~~/dung is used on the walls & as fuel.
All these factors lead to ↓ bodily & mental vigour & perpetuate sickness.

2. Environment. poor sanitation & flies cause the spread of dysentery, diarr., ~~enteritis~~ trachoma, dermatological & puerperal inf. & ankylostomiasis.
poor water supply causes the spread of salmonella & shigella inf., amoebiasis, malaria & filariasis.

3. Undernutrition even tho' they prod the food most of it is sold to obtain money for other purposes, they also prefer to grow cash crops instead of food mat.
In many families the unit yield of the land is not sufficient to meet their needs.
* They also have an ↑ cal. reqmt of abt 3,800 cal per day which cannot be met. This prod a low res to dis.

4. Ass: c̄ plants & animals. prod. dermatitis, eczema, insect bites also scorpions, centipedes, reptiles etc.

5. Even young children & women have to work.

6. They have to perform a variety of tasks & working hrs are variable acc to season & weather.

7. Lack of communication & transportation affects their ability to seek medical help.

8. Inadequate health services & immuniz. programmes. affects mainly communicable diseases, malaria, infant & child mortality

9. Psychosociological prob — lack of leisure & amusement & isolation of farms influences their lives & health.

Sp. Occupational hazards -

I **Farm accidents** d/o machinery like tractors, badous etc. weather like extreme heat, cold & rain i/c they have to work.
wind & dust may impair the vision.
irritation by dust, insect-bites, exhaust fumes etc.
cramped pos. of work in machines affects the vert. col etc.
around the home - d/o workshop equipment for welding, grinding, drilling, saws, shears etc.
Misc - d/o poisonous insects & reptiles, electrical hazards from equipment & power lines, explosions, drowning in ponds, ditches etc.

II **Poisoning** d/o agricultural chemicals, pesticides ~~parathion etc~~. This is not so common as above.
- ac. poisoning occurs d/o organophos. compounds, chlorinated hydrocarbons & phenols. - occurs by inhal. or percutaneous.
- Delayed eff. are prod by alkyl mercury comp used mainly as seed dressings.
- Dermatitis is of nuisance value but there is a long term possibility of carcinogenicity.
- Dust ĉ penetrate the resp. tr more deeply.

III **Dis d/o viruses, bact, fungi & parasites are common** d/o close contact ĉ animals & their prod, contaminated soil, water & sometimes air. Eg
Viral encephalitis, hemor. fevers like Kyasanur forest dis ĉ are tick borne. Also psittacosis & rabies
Rickettsial Q fever & scrub typhus.
Bacterial - anthrax, brucellosis, erysipeloid, leptospirosis, tetanus, TB, plague
fungal - trichophytosis, actinomycosis, histoplasmosis
parasitic - ancylostomiasis, schistosomiasis
Malaria & echinococcosis.

measures

Gen. protection

1. Education in dangers of exposure to agents of dis., animals, places & ~~things~~ machinery etc.
2. ~~Use of vaccines, sera & drugs~~
3. Precautions in handling the above
4. Use of insect repellant
5. " " protective clothing, boots, gloves.
6. boiling of water, milk & proper cooking of food.
7. Rx or slaughter of infected animals.
8. Sanitary disposal of dead animals.
9. Screening of dwelling places, animal quarters.
   spraying or use of insecticides.

Sp. protection

1. Reporting of human & animal dis. & death – wh. possible
2. Immunization – active or passive using vaccines/sera
3. Drugs & other chem. prophylactic measures
   also suppression of vector
4. Sanitation – personal & community. eliminate breeding places
   safe water supply & proper disposal of waste.
5. personal protection by clothing, insect repellants, hoods
6. Health services – & 1st aid.
7. Health education using audiovisual aids, press, magazines & radio.

1. occupational health aims at the adaptation of work to man & of each man to his job.

INFORMATION TO BE OBTAINED FROM SURVEYS AND MEDICAL EXAMINATIONS

Example 1 : Type of information obtained from preliminary surveys

This example lists the type of information that is particularly applicable to monitoring at the National or Regional level. It may be supplemented by data obtained during more detailed surveys.

PLACE OF WORK

Name and address

OFFICIAL CONTACT

Name and title

DATE AND TIME OF SURVEY

EMPLOYEES

Demographic data, e.g., number, sex, age, employment status, arrangement of working hours

PROCESSES

Description, including raw materials and intermediate and end products

POTENTIAL HEALTH RISKS

List by process, including population exposed and information on any prior measurements of risks; eg.:

CHEMICAL AGENTS such as toxic aerosols and liquids
PHYSICAL AGENTS such as excessive temperature, noise, radiation, inadequate illumination
BIOLOGICAL AGENTS such as infected materials handled
ERGONOMIC AND PSYCHOSOCIAL FACTORS such as machine design, methods of payment, joint consultation, lines of communication
Other RISKS requiring specific evaluation (indicate and attach relevant forms)

CONTROL MEASURES AVAILABLE

Indicate, with assessment of condition and efficiency, eg., total enclosures, ventilation, machine guards, personal protective devices

SANITARY FACILITIES

Drinking water, washing facilities, locker rooms, toilets, eating and recreation areas, methods of disposal of wastes, including solids, liquids and aerosols

HEALTH AND SAFETY PERSONNEL

Description, numbers employed (full and part-time)
Health personnel - eg., physicians, hygienists, nurses, assistants, first aid attendants
Safety personnel, eg., safety supervisors, safety engineers

HEALTH AND SAFETY FACILITIES

Health facilities, eg., hospitals, health departments, dispensaries, first aid stations, first aid kits, ambulances, records

Safety facilities, eg., safety equipment (general and personal) records.

.....2

HEALTH AND SAFETY PROGRAMMES

Health programmes, eg., pre-employment, periodic and special medical examinations; routine and special environments and monitoring programmes; counselling and education; frequency of visits by health personnel to workplace; supervision of sanitary facilities; types of reports made

Safety programmes - eg., counselling and education; inspections (routine and special) other than accident investigation; accident investigations; emergency procedures; types of reports made

CONCLUSIONS

General findings, recommendations, follow-up

Example 2. Type of information obtained from medical surveys

This example gives the type of information obtained during the medical monitoring of individual workers. Where specific hazards are known to exist, the information should be supplemented by a special diagnostic test of the kind illustrated in Example 3 of this Annex.

PERSONAL DATA

Name, identification number, sex, date of birth, address, workplace (plant and department)

SOCIAL HISTORY

Education, marital status, family size, living conditions

OCCUPATIONAL HISTORY

Present occupation - duration, hours of work, shifts, degree of responsibility, potential hazards and unusual job demands (as stated by the worker), his/her opinion of job

Previous occupations - date of first employment, types of employment, potential risks and duration of each job

FAMILY MEDICAL HISTORY

Relevant diseases, eg, infections, tuberculosis, mental illness and cardiovascular diseases

PAST MEDICAL HISTORY

Previous illnesses and operations, including any ill-health or disability related to employment

PRESENT MEDICAL HISTORY

Present complaints or symptoms including endemic diseases
Personal habits - smoking, alcohol and drugs

CLINICAL EXAMINATION AND ASSESSMENT OF CAPACITIES

Weight, height and other anthropometric data
Examination of organ systems for defects and for assessment of capacities, eg., vision - acuity and visual fields
hearing - audiometry
cardiovascular system - blood pressure, exercise test, and electro-cardiography
blood - haeglobin cell counts and platelets, lipids, monitoring tests for toxic agents in blood
respiratory system - chest X ray, lung function tests, monitoring tests for toxic agents in exhaled air.

INFORMATION TO BE OBTAINED FROM SURVEYS AND [illegible]

Example 1 : Type of information obtained from preliminary surveys

This example lists the type of information that is particularly applicable to monitoring at the National or Regional level. It may be supplemented by data obtained during more detailed surveys.

PLACE OF WORK

Name and address

OFFICIAL CONTACT

Name and title

DATE AND TIME OF SURVEY

EMPLOYEES

Demographic data, e.g., number, sex, age, employment status, arrangement of working hours

PROCESSES

Description, including raw materials and intermediate and end products

POTENTIAL HEALTH RISKS

List by process, including population exposed and information on any prior measurements of risks; eg.:

CHEMICAL AGENTS such as toxic aerosols and liquids
PHYSICAL AGENTS such as excessive temperature, noise, radiation, inadequate illumination
BIOLOGICAL AGENTS such as infected materials handled
ERGONOMIC AND PSYCHOSOCIAL FACTORS such as machine design, methods of payment, joint consultation, lines of communication
Other RISKS requiring specific evaluation (indicate and attach relevant forms)

CONTROL MEASURES AVAILABLE

Indicate, with assessment of condition and efficiency, eg., total enclosures, ventilation, machine guards, personal protective devices

SANITARY FACILITIES

Drinking water, washing facilities, locker rooms, toilets, eating and recreation areas, methods of disposal of wastes, including solids, liquids and aerosols

HEALTH AND SAFETY PERSONNEL

Description, numbers employed (full and part-time)
Health personnel - eg., physicians, hygienists, nurses, assistants, first aid attendants
Safety personnel, eg., safety supervisors, safety engineers

HEALTH AND SAFETY FACILITIES

Health facilities, eg., hospitals, health departments, dispensaries, first aid stations, first aid kits, ambulances, records

Safety facilities, eg., safety equipment (general and personal) records.

.....2

HEALTH AND SAFETY PROGRAMMES

Health programmes, eg., pre-employment, periodic and special medical examinations; routine and special environments and monitoring programmes; counselling and education; frequency of visits by health personnel to workplace; supervision of sanitary facilities; types of reports made

Safety programmes - eg., counselling and education; inspections (routine and special) other than accident investigation; accident investigations; emergency procedures; types of reports made

CONCLUSIONS

General findings, recommendations, follow-up

Example 2. Type of information obtained from medical surveys

This example gives the type of information obtained during the medical monitoring of individual workers. Where specific hazards are known to exist, the information should be supplemented by a special diagnostic test of the kind illustrated in Example 3 of this Annex.

PERSONAL DATA

Name, identification number, sex, date of birth, address, workplace (plant and department)

SOCIAL HISTORY

Education, marital status, family size, living conditions

OCCUPATIONAL HISTORY

Present occupation - duration, hours of work, shifts, degree of responsibility, potential hazards and unusual job demands (as stated by the worker), his/her opinion of job

Previous occupations - date of first employment, types of employment, potential risks and duration of each job

FAMILY MEDICAL HISTORY

Relevant diseases, eg, infections, tuberculosis, mental illness and cardiovascular diseases

PAST MEDICAL HISTORY

Previous illnesses and operations, including any ill-health or disability related to employment

PRESENT MEDICAL HISTORY

Present complaints or symptoms including endemic diseases
Personal habits - smoking, alcohol and drugs

CLINICAL EXAMINATION AND ASSESSMENT OF CAPACITIES

Weight, height and other anthropometric data
Examination of organ systems for defects and for assessment of capacities, eg., vision - acuity and visual fields
hearing - audiometry
cardiovascular system - blood pressure, exercise test, and electro-cardiography
blood - haeglobin cell counts and platelets, lipids, monitoring tests for toxic agents in blood
respiratory system - chest X ray, lung function tests, monitoring tests for toxic agents in exhaled air.

Revision Tutorials

①: Occupational Health

a) Definition — Joint ILO/WHO
- Promotion – health
- Prevention – departures from health
- Protection – risks r hazard
- Placing / maintenance of workers.
- adaptation of work to man and man to his job

b) What is the scope of occupational health.

i) Risks to workers
ii) Risks to public
iii) fit workers for job.
iv) fit job conditions for workers
v) social problems of occupations and their medical consequences

c) What are the physical hazards in Industry / Diseases caused

d) " chemical " " "

e) " biological " " "

f) " mechanical " " "

g) " psychological " " "

h) What are the Industrial lung diseases. – classfn

i) What are the pneumoconiosis – Dust size 0.5–3 μ.

j) What are the occupational cancer risks?

k) " occupational hazards of agricultural workers?

l) " hazards of ionizing radiation?

m) " Occupational Dermatitis :) Classification of agent

n) Medical measures in Prevention of occup. disease

o) Engineering "

p) Preplacement / Periodical examination.

q) Industrial accidents

r) Importance of Health Education

② Social Securities

i) Defn Security that society furnishes against certain risks which its members are exposed to — sickness, invalidity, maternity, old age and death"
— Function of a welfare state.

ii) Scope Social insurance
Social assistance
Commercial insurance

iii) Social Security in India

a) The workmens Compensation Act, 1923
b) State Maternity Benefit Act 1929-48
c) Mines Maternity " " 1941.
d) The Coal miners Labour welfare Act 1946.
e) The Employees' State Insurance Act 1948.
f) " Employees Provident Fund Act 1952
g) " Central Maternity Benefit Act 1961
h) Unemployment insurance Act 1966
i) The family pension scheme 1971. (Industrial workers)
j) The Plantation Labour Welfare Act (1951)
k) Central Govt. Contributory Health Scheme'
CHS.

iv) Pension
Gratuity
Provident fund
Family Pension

1

Revision Tutorials

1. Defn- Joint ILO/WO

Promotion — Health
Prevention — Departures from Health
Protection — Risks/Hazard
Placing/Maintenance in suitable job
Adaption of work to Man and Man to his job

2. Occupational Hygiene
Ergonomics.
Environmental Hygiene/Medicine.

3. Occupational Environment- Interactions

4. Hazards v Occup diseases

Physical - Heat/Cold/Light/Noise/Vibration
Pressure/UR Radiation/Ionising radiation

Chemical ~~Act~~ Local/Inhalation/Ingestion
↓
Dusts/Gases/Metallic fumes

Biological - Bacterial- Anthrax/Brucellosis/Leptospirosis
Tetanus
Viral — Fungal — Schistosomiasis
Protozoal- Psittacosis — hydatidosis

Mechanical

Psychosocial

5. Occupational Diseases

Cancer
Dermatitis
Pneumoconiosis — Inorganic / organic
Industrial Stress / Psychosis
Radiation Hazard

6. Occupational Hazards of Agr. Workers

Zoonosis / Accidents / Toxic / Physical / Respiratory

7. Accidents

Human — Physical / Physiological — sex / Age / Time / Experience / Habit / Attn. / Psychological
Environmental Factor

8. Sickness Absenteeism — Economic / Social / medical.

9. Health Problems due to industrialization

Pollution — Air / Water / Land — Communicable Diseases / Mental Health
Poor Env. Sanitation
Accidents / Social Problems

10. Medical Measures

Preplacement
Periodic
Medical Services
Notification
Monitoring Work environment
Records
Health Education
Counselling

11 Engineering Methods

General
Design
Housekeeping
Ventilation

Specific
Mechanization
Substitution
Dust/wet processing
Enclosure

Isolation
Local exhaust ventilation
Protective Device

Env. Monitoring / Stats monitoring / research

12 Legislation

Factories Act-(1976) all except Jrk.

Scope- 10+ E power or 20+ E out power
perennial / seasonal no distinction

Health / Safety / Welfare provision
Employment of young person
Hours of work
Leave & wages
Occupational Disease

(1976)
Asbestos
Byssinosis
Occupational Dermatitis
Noise induced deafness

13. ESI Act 1975

- Social Security / Health insurance
- Cash + medical benefits

OCCUPATIONAL HEALTH

① ILO/WHO Definition

② Widening scope of occupational health (ref: Industrial Health)

③ Ergonomics: "Science of fitting job to the worker"
- Mutual adjustment of man and work for improvement of human efficiency and well being.

④ Scope of occupational Health
i) occupational disease and injury: risks to worker
ii) Environmental contamination: risks to public
iii) Medical surveillance: fit the worker for the job.
iv) Studies of work: Fit the job conditions for the worker
v) Social problems and their medical consequences

⑤ Occupational Environment:
"Sum of external conditions and influences which prevail in the place of work and which have a bearing on the health of the working population"
i) Man and physical, chemical and biological agent
ii) man and machine.
iii) man and man (coworker, employer, family)

⑥ Occupational Hazards

1. Physical. Temperature, Light, Noise, Vibration, Radiation

2. Chemical — Local action, Inhalation, Ingestion

3. Biological — Animal husbandry, Agricultural Workers, Rat infested workplaces.

4. Mechanical trauma and accidents

5 Psychological hazards

Causes:
Emotional tension
Fear
Frustration
Lack of Job satisfaction
Poor industrial relationships
Insecurity
Stress of automation

⑦ Occupational diseases — List in Park p561

⑧ Industrial lung disease

⑨ Occupational cancer risks.

(10) – Pneumoconiosis Silicosis, Byssinosis, Asbestosis, Farmers Lung, Anthracosis.

– Lead poisoning.

– Occupational Dermatitis.

– Radiation Hazards –

(11) Occupational Hazards of Agricultural Workers

i) Accidents
ii) Infective & parasitic disease
iii) toxic hazards
iv) Physical hazards
v) Wild Life

(12) Looking at risks in Workplaces.

(13) Principles of Prevention – (1) Recognise Hazards – (2) Determine exact methods of Δ and safe limits.

(3) Legge's aphorisms.

(4) General Health measures
- Nutrition
- Environmental Sanitation
- Communicable disease contr
- Mental health ← recognition, Job satisfaction, reward, discipline
- Measures for women & children
  - maternity benefit
  - free ANC & PNC.
  - (Factories Act) prohibition of night work
  - (Mines Act) " of work underground
  - creches
  - age limit 14+
- Health Education: management, Supervisory staff, trade union leaders, Workers, Community
- Family Planning

(5) Prevention of O.D

Medical measures

1. Preplacement exam
2. Periodical exam
3. Prevention, medical care and first aid.
4. Notification
5. Supervision of working environment
6. Maintenance and Analysis of Health Records.
7. Health Education.

Engineering Measures

1. Design of buildings
2. Good housekeeping.
3. General ventilation
4. Mechanisation
5. Substitution
6. Enclosure
7. Isolation
8. local exhaust ventilation
9. Suppression

10. Dilution
11. Protective device
12 environmental survey
13 Research

(6) Legislation :- Scope and enforcement of minimum standards.

Indian Factories Act, 1948

Earliest Act 1881 — revised many times & updated

Scope: Factory defined as establishment :
10 or more workers where power is used
20 or " " " " is not "
No distinction between perennial / seasonal factories
Applies to whole of India except J & K.
State govts authorised to appoint Chief and insp. of factories

(a) Health, Safety and welfare of workers

Health Cleanliness
Lighting
ventilation.
disposal of wastes and effluents
elimination of dust and fumes
provision of spittoons.
Control of temperature
Supply of cool drinking water
cu ft per worker to prevent overcrowding

Safety - fencing of machinery
Safeguards against accidents
protection of eyes
casing of parts
precautions against fumes & explosions
maximum weights which may be lifted or carried by m. & w or ch

welfare washing facilities
first aid.
canteens
Creches
rest shelters
welfare officers
Seating arrangements.
Suitable place for workers clothing and drying of wet clothes.

(b) Employment of young persons

Prohibits employment below 14.
Adolescents 15-18 - certified by cert. surgeon as fit to work
Reductions on employment of women & ch in dangerous occupation

(c) Hours of work.

48 Hrs/wk
Not exceeding 9 Hrs/day
& 1/2 Hr rest every 5 Hrs
Overtime. Should not exceed 50 hrs in quarter of the year

(d) Leave with wages - besides weekly holidays

Leave & wages after 12 months service
Adult 1/20 days minimum 10
Children 1/15 " 14

(e) Occupational Diseases

- Obligatory accident reporting < causing death / causing serious bodily injn
- " Occup D. "
- Authority to Factory inspectors to take samples of harmful substance

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E.S.I Act 1948

- Imp. measure of Soc Security
- Scope - non seasonal factories run & power employing 20 or more persons excluding mines, defence & railways installations
  - all employees - manual, clerical supervisory or technical. who get remuneration upto Rs 500/month
- Admn
  ESI corporation
  Director General ESI + 4 principal officers < Ins com / Med com / Fin Adv / Chief Actuary
  Medical Benefit Council - headed by DGHS.
  State wise Regional offices.
  Inspection officers.
- Finances
  Employer 4% of total wage bill
  Employee 2.5% of wages
  State Govt - 1/8 expd of medical care
  ESI Corpn. 7/8 "
- Benefits

(1) Medical Benefit

OPD Care
Supply of drugs & dressings
Specialist services
Path services & Xrays
Domiciliary services
ANC, NC and PNC.
Immunization
FP Services
Emergency services
Ambulance services
Health Education
Inpatient services
Specialised institutional Rx

(Extra) Also
Dentures
spectacles
Hearing aids
Art. limbs
hernia belts
walking calipers
surg. boots
Spinal braces & jackets

Delivery

1. ESI dispensaries (Less than 750 employees)
2. ESI hospitals
] Direct

3. Scattered residential conc. – Panel system of Insurance
Indirect
Med. practitioners each allowed max. 750 units.

Cost
1961-62 23.79 / worker
1969-70 – 58.91 / worker
Ceiling of Rs 50 / yr / worker
Excess – met by State Govt.

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(2) Sickness Benefit

56 days in 365 days at 7/12 average daily wages
Certif by Ins. Med Practn

(Extra) Extended sickness benefit

Group A – 309 Days
TB, leprosy, Malignancies,
Mental disease, Paraplegia,
Hemplegia, CCF, Immature cataract c 6/60 vision

Group B – 124 days
Bronchiectasis, Lung Abscess
MI, Parkinsonism
Iv Disc prolapse, Gangrene
Aplastic Anemia, Ankylosing Sp
Cirrhosis, Fracture of lower L
Detachment of Retina

(Extra) Protectn against dismissal or discharge

(3) Maternity Benefit

12 wks full wages – not more than 6 wks ANC
Additional M.B for – miscarriage – 6 weeks following it
Sickness arising out of pregnancy
1 month addition – ″ confinement
premature birth of child

(4) Disablement benefit – temp or permanent disablement due to employment injury or O.D.
72% of wages as long as temp. 72% Life pension (perm

(5) Dependants Benefit

If employee dies as result of OD or employment injury.

DB for widow and children till 18

Above 18 if continue education

withdrawn if daughter marries

Pension - 25% more than Std Benefit rate.

(6) Funeral Benefit - Not exceeding 100 Rs. on the death of an insured person

1970

Implemented in all states

20543 Factories

1,57,61,300 beneficiaries

Other Acts

Mines Act

Plantation Labour Act

Minimum Wages Act

Maternity Benefit Act.

Occupational Health in India

ESI Act 1975 (Amendment) Extended to following establishments

a) Small power-using factories employing 10-19 persons and non power " " " 20 or more persons under factories Act.

b) Shops

c) Hotels & Restaurants

d) Cinemas & theatres

e) Road-motor transport establishment

f) newspaper establishment

Covers all employees — Manual, clerical, Supervisory, Technical — Wages not exceeding Rs1000/- per month

Admn

Union Ministries for Labour — Chairman
" for Health — Vice Chairman

↓

ESI Corporation
(Central/State Govt, employers, employees organizations, Med. prof. - parliament

↓

Standing Committee
(Executive body for administration)

↓

Director General

Insurance Commr	Medical Commr	Financial Adviser & Chief Accounts Off.	Actuary

↓

Medical Benefits Council
DGHS

↓

State wise Regional office

↓

Inspection off-

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(1) 1 Dispensary for 1000 family units
1 doctor 60 patients/day + 1 H.V

(2) 1 part time dispensary in areas where less than 750 emplo

(3) Insurance Medical Practitioners - 750 family units

Doctor Population Ratio 1:585 National 1:4370

Extension to families

Restricted medical care - OPD

Expanded medical care - Full medical care short of hospitalisation

Full Medical Care.

2·62 beds/1000 employees — Avin 4 beds/1000 employe
0·49 " " (National)

Cost 1973-74 - Rs 6753 per capita

Occupational Diseases

1. Pneumoconeosis – Silicosis
   Anthracosis
   Byssinosis
   Bagassosis
   Asbestosis
   Farmers lung
2. Lead Poisoning
3. Occupational Dermatitis
4. Radiation Hazards
5. Hazards of Agricultural Workers
6. Industrial Accidents.
7. Sickness Absenteeism
8. Legislation in India
9. Occupational Health in India

Industrial Accidents

Statistics – (1958) 91.86 – temporary disablement.
5.86 permanent
2.28 fatal

Accident rate / 1000 worker

Mines 49.39 Docks – 45.55
Railways 20.35 Factories 18.51
Construction 22.21 Plantations – 2.06

Effects
(1) Worker – wages loss
– suffering

(2) Industry – compensation costs
– provision of medical care
– lowered morale
– lowered production
– damage to machinery and goods

(3) Nation – lost production – effect on economy

Causes
(1) Human – Physiological (sex – ♂♀, Age – extreme, Time, Experience, working hours)
– Psychological (carelessness, inattentiveness, Over confidence, Slow reaction, inexperience, emotional disturbance, accident proneness)

(2) Environmental
– temperature
– poor illumination
– humidity.
– noise
– unsafe machines

Prevention
1. Adequate preplacement examn
2. " Job training
4. Safe working environment
5. Safety organisation
7. [illegible] and publicity

OCCUPATIONAL HEALTH PROBLEMS IN INDIAN INDUSTRY

(1) THE WORKING POPULATION

In 1971 the working population of India was about 18.04 crores or 32.9% of the total population. Nearly 70% of this population were involved in agriculture as cultivators or labourers and the remaining in plantations, mining and quarrying, manufacturing, processing and repair industries, trade and commerce and the construction and transport industry.

Table I

Distribution of working Population (1971)

Categories	Total Workers in '000	Percentage
1. Cultivator	76,176	43.34
2. Agricultural labourer	47,469	26.33
3. Plantations, livestock and forestry	4,296	2.33%
4. Mining and quarrying	922	0.51
5. Manufacturing, processing and repair	6,351	3.52%
a) Household		
b) Other than household	10,715	5.94

	1000	Percentage
6. Construction	2,215	1·23
7. Trade and Commerce	10,036	5·57
8. Transport, Storage and Communications	4,401	2·44
9. Other services	15.765	8·74%

(2) Among the industrial working population of about 20·30 million the following major industrial groups occur. in '000

i) Processes allied to agriculture (gins + presses) (141)
ii) Food (675)
iii) Beverage (18)
iv) Tobacco (121)
v) Textiles (1249)
vi) Footwear + wearing apparel (63)
vii) Wood + cork (87)
viii) Furniture/Fixtures (16)
ix) Paper and paper products (70)
x) Printing/Publishing (139)
xi) Leather + leather products (25)
xii) Rubber and rubber products (70)
xiii) Chemical and Chemical products (246)
xiv) Products of Petroleum and coal (24)
xv) Non metallic mineral products (259)
xvi) Basic Metal industries/metal products (499)
xvii) Machinery (360)
xviii) Transport equipment (494)
xix) Electrical machinery (204)
xx) Electricity/Gas/Steam (62)
xxi) water + Sanitary services (10)
xxii) Recreation Serv (3)
xxiii) Personal Ser Laundry et (7)
xxiv) Misc (175) industr

(3) The major Occupational Hazards

May be classified as

By type of Hazard

1. Accidents - Mechanical Hazards.

2. Physical Hazards — Heat / Cold
Vibration
Noise
Radiation
Light.

3 Chemical Hazards — Dusts
Fumes
Metals.
Solvents - organic products] solids
metallic salts, acids, alkalies - inorganic products] liq.

4. Biological hazards — Bacteria, Virus

5. Psychosocial hazards

By type of diseases

1. Pneumoconiosis
2. Industrial Dermatitis.
3 occupational Cancers
4. Eye conditions
5. Hearing impairment
6. Neurological complications
7. Blood dyscrasias

8. Circulatory disturbances

9. Miscellaneous pathology.

(4) Special Features of India.

a) Tropical environment - Problems of Heat.

b) Nutritional status of workers

c) Skin pigmentation.

d) Population Genetics - enzyme deficiencies

e) First generation workers
low technological experience of workers

f) Religious / Social / cultural factors

g) Ergonomics problems due to borrowed technology and machines based on western anthropometric measurement

h) Illiteracy and low level of education

i) More biological hazards - infective, communicable diseases parasitic infestations

j) Housing and living conditions
- overcrowding.

k) Poor environmental sanitation

l) poor personal hygiene.

(5) Hazards in Specific industries

Mining - Pneumoconiosis, Pulmonary TB. Miners nystagmus. Rheumarthritis
workloads
Coal, Gold, mica Problems of heat

Manganese Mining - Parkinsonism
pneumoconiosis

Chromite ulceration nasal/palate.

Textiles - Malnutrition Noise. workloads
Byssinosis Accidents

Viscose Rayon - SO_2, H_2S and CS_2 contamination.

Light engineering
metal grinders - silicosis/lung fibrosis

Steel Resp hazards - gas poisoning
Phys/Chemical hazards - pulm TB

Chemical - DDT poisoning - chronic/acute
Benzene " anemia

Ceramics - silicosis / Pulmonary TB

Industrial Dermatitis – Alkali
Acid
Butyl acetate
hydrocarbons
cement
Dinitrochlorobenzene
Glasswool
Kerosene
Varnish
$ZnCl_2$

(6) Magnitude of Problem

Silicosis

a) Hand drillers in Mica Mines Bihar - 27% of drillers were suffering from silicosis and 19.6% were cases of Pulmonary TB

b) Female workers in ceramic and pottery industries, 3 out of 27 workers

c) 15% showed evidence of nodular silicosis out of 921 pottery workers on an all India basis.

d) 30.4% of population studied in lead and zinc mines of Rajasthan showed radiological evidence of Silicosis

e) 27% of metal grinders suffered from silicosis

f) 16.9% of refractory workers in Bihar suffering from Silicosis

Coal Miners Pneumoconiosis

18.8% of the Coal miners of Jharia and Raniganj show radiological incidence of pneumoconiosis.

Carbon di Sulphide

7.4% showed nervous symptoms
44% showed gross anemia
] in rubber rayon factory

Dichromate Manufacturing industries

20.9% had skin infection
19.7% had typical skin ulcer.
20.9% - nasal cartilage perforation
20.6% nasal mucous membrane ulceration

Lead – 10.6% Showed clinical signs and symptoms
48.7% showed undesirable levels in blood

25.6% of hand compositors in Printing presses in Bihar Showed signs & symptoms of Lead Poisoning

Hearing impairment

50% of workers in a Nitric acid Plant showed poor hearing

Manganese poisoning in a ferromanganese plant

Completely disabled 7.3%
partially " 16.8%
Symptoms only 16.6%

Disturbances in visual performance

a) 34% of cases were clinical cases in Textile/Engineering industries surveyed

b) In a welding industry
60% complained of eye symptoms
70% had conjunctivitis, keratoconjunctivitis, pterygium, incipient cataract
15.6% visual skills below normal

—

Industries represented or seen

Heavy Electricals
Oil Refinery
Steel 1+1
Shipbuilders/Engineers
Hindustan Aeronautics
Construction/Heavy Machinery
Transport
~~Batteries~~
Aluminium
Locomotives
Port/Dock
Petrochemicals
Precision Bearings
Electrical appliances

IIM Course 19/10/79

Occupational Health in Primary Industries

(Agriculture - Plantation and Agrobased Industries)

1. Relevance of Topic

a) Our group represents

Occupations -
- Dyes / Chemicals / Petrochemicals
- Coal fields
- Scooter Manufacturers / Heavy vehicle
- Refineries
- Aeronautics / ISRO

Medical Specialty -
- Industrial Medical officers
- Psychiatrists
- Administrators

In the era of specialisation

b) What is the relevance of OH in Agriculture and related industries to above group

OH career

i) Distribution of Working population in India - Agriculture Plantations / Livestock Forestry etc = 72% of work force.

ii) Most neglected occupations in the country - Service / Research criteria.

iii) Problems - Hazard to Total population
Family-based cottage industry.
Unorganised sector

iv) Lessons from 'Green revolution' - eye openers to the medical profession.

v) Modernisation of Agriculture - Farmer is consumer of many of our products

c) Our Experience & study of some of these occupations/ groups of people. – gives us a starting point for discussion of issues which you face – same problems in a different situation.

i) Importance of Holistic view.

ii) Importance of Primary/Secondary monitoring

iii) Workers education.

iv) workers participation in health care.

v) Union education

vi) Consumer protection

vii) Legislation to be strengthened by creating public opinion through media.

viii) Continuing Education of Health Team

(2) Scope of OH in Agriculture or Agricultural Medicine

a) Basic interactions — Man & Env. factors
Man & Machines
Man & Man.

b) Agricultural Industry

(1) Production - Agriculture / Plantations / Forestry
Raw materials — Animal husbandry / Fisheries
Sericulture etc

(2) Processing - Food processing / Extractions.
Rope making / weaving

(3) Rural Industries - Smithys, Masonry
leatherwork, Pottery.
Handicrafts, Metal works etc

c) In the villages these processes vary
from Traditional Home based → Traditional Group based → Modern Small scale units

d) Situation Analysis - Identified Factors
Agricultural Workers — All Age groups.
Supporting Dependent population.
Tradition bound.
Economic relationships vary
Illiterate.
On the job training

Agricultural Work

Multifarious jobs.
Multifarious responsibilities
Seasonal pressures.
Varying degrees of skill

Work environment

Physical –
- Inclement weather - Hot/cold/Rain
- Long hours of work / Physical exertion
- Long travel to work spot.

Chemical –
Fertilisers
Pesticides / Herbicides / Fungicides
Weedicides / Acaricides

Biological –
- Plants - allergies / Toxins
- Bites / Stings
- Exposure to dust / spores
- Infectious & parasitic disease
- Animals – Zoonoses

Psychosocial
Isolation
Seasonal unemployment

Mechanical –
Agr. implements
" Machinery
" Transport

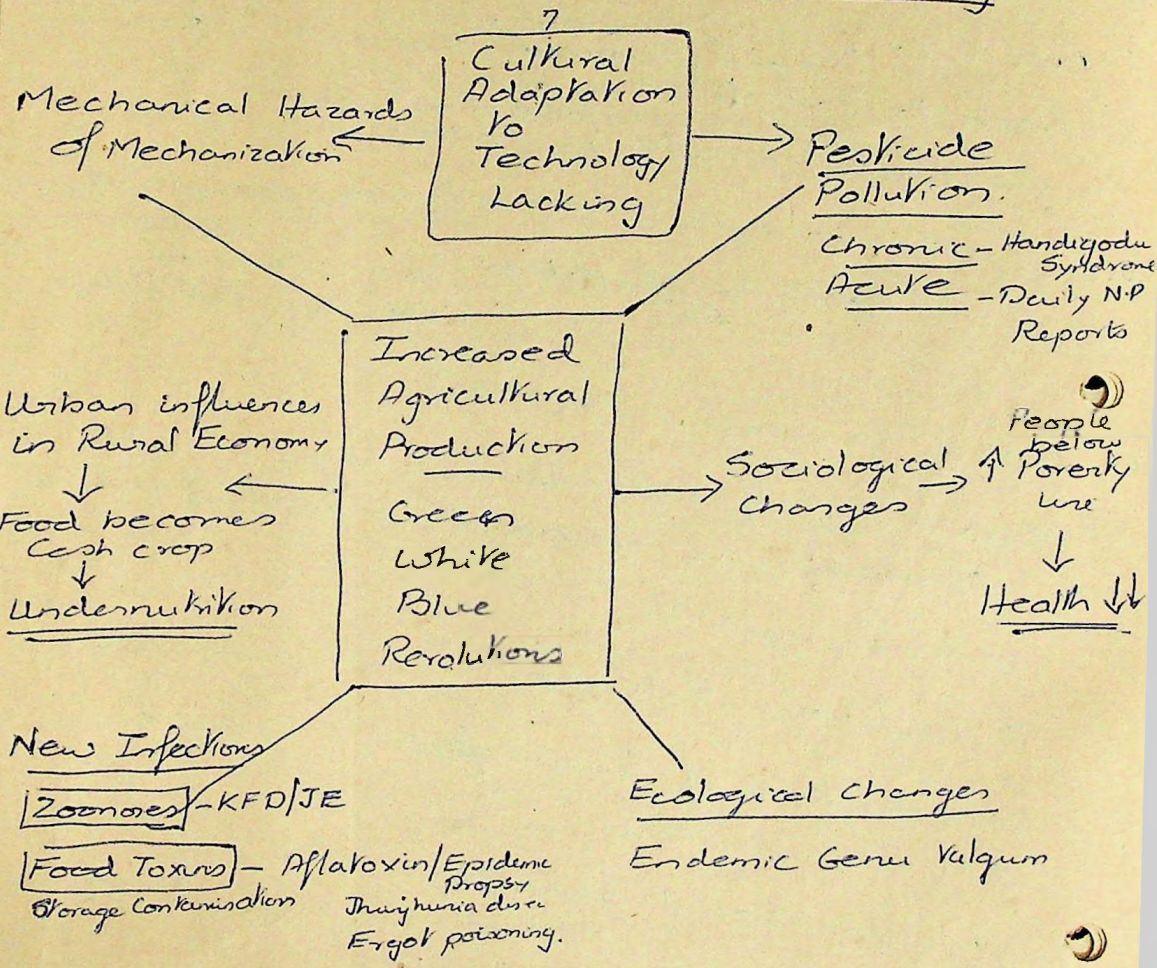
Specific hazards
Tea workers asthma, Silk dermatitis / Resp disease
Coffee workers lung. Farmer's lung
Copra itch

(3) How to tackle problem of this Sector

1. Need to highlight importance in all forums Govt / Associations / Industrial professional
2. Need to collect all known data / start research projects to collect new data (information network)
3. Epidemiological projects on groups of workers
   - ROSS - Tea / coffee / Rubber / Silk
   - ROHC - Copra / coir
   - NIOH - Sugar / Paddy / Tobacco
4. Need to orient PHC MOs
5. Involvement of Agricultural colleges – Health of worker as important as health of machine
6. Consumer protection
7. Indiv. / Group Education
8. Introduction of known facts in general education system
9. Legislation / Social security
10. Coordination at all levels

=

(4) Holistic / Ecological Concept Necessary



(5) Other Areas of Cooperation

i) Labelling of Agricultural Chemicals - keeping illiterate farmer in view

ii) Planning Agricultural machinery/vehicles keeping technological level of village populations in view.

iii) Strick effluent control to prevent contamination of soil/water resources e.g Minimata Disease

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OCCUPATIONAL HEALTH

1. Occupational Environment interactions
2. Types of Hazards to look for in a job
3. 'Industrial' to 'occupational' why?
4. Distribution of Working population in India.
5. Agriculture related workers = 72.05%

6. Agricultural Industry (Slides)
   1. Production.
   2. Processing.
   3. Rural Handicrafts

7 Situation Analysis

Agricultural Worker 70%

All age groups.

Supports large dependent population

Tradition bound

Types of workers

Agricultural Work

- Multifarious jobs/same worker
- open air work
- Simple tools
- Seasonal pressures

1/cont.

- Problems of contact ē soil
  animal / plant life.
- Distances to be travelled
- seasonal unemployment
- Advent - of mechanisation
  . Agricultural Chemal
  Technological change in the absence of cultural change

Agricultural Machinery

Implements - for all types of job

Traditional designs vs Modern designs

- Injuries
- Ergonomic problem / WR
  - handling

Agricultural Chemicals

Pesticides
Fertilizer
Fungicides
Herbicides
Rodenticides

Occupational diseases

Principally contracted
Occasionally "
exceptionally "

Hazards

Areas of Research

1. Pesticide Pollution
2. Ecological changes - KFD / JE | Nidality of Transmission
   Endemic Genu Valgum
3. Handigodu Syndrome.
4. Food toxins - Ergot - Bajra (Claviceps purpurea) / Hepatitis
   Myco
   Lathyrism
   Aflatoxin - Aspergillus flav

Industrial Health, Diseases of Occupation

Maxcy. Chapter 31.

(1) Scope & Modern Concepts of Industrial Health

i) Objectives

ii) Definition

iii) Preventive phase

a) Occupational diseases

b) Physiological effects of physical factors

c) Abnormal stresses of work.

d) Effects of working environment and conditions of work on
- comfort & ability to work
- on degenerative diseases
- on resistance to infectious disease

e) Prevention of industrial infections e.g. anthrax

f) Study & control of Env. pollution

g) Surveillance for non-occupational disease.

(iv) Constructive Phase

a) Promotion of health & well being of workers

b) Determination of optimum work conditions

c) Design of machinery/process to reduce stress on body

d) Selecting job based on physical and mental capacities of workers

e) rehabilitation of handicapped.

f) Promotion of good human relations and mental hygiene.

v) Importance of Research Studies

a) Biological

b) Engineering

c) Chemical

d) Medical

(2) The industrial population

i) Extent of Working population

ii) Age-distribution } features

iii) Sex-distribution }

iv) Types of employment.

v) Trends in last decades

vi) Distribution by size of industry/factory/unit (with reference to ability to support own health service or rely on group service)

(3) Occupational Diseases

Classification :-

Diseases resulting from

a) Chemical substances

b) Physical state of environment

c) Mechanical factors

d) Biological factors

Chemical Exposures

1. Types liquids
gases
vapors
dusts
fumes
smoke
Mist/fogs

2. Chemical/Physical Properties of materials

i) Solubility - water or fat

ii) Chemical structure

iii) Conjugation

iv) Size of particle

3. Hours of Effect of Chemical Substance

i) Local action - skin, eyes, upper R.T.
ii) Deeper Resp tract / gastric mucosa.
iii) Systemic toxicity.
iv) Effects on internal organs
v) Allergic reactions
vi) Changes in immune mechanism
vii) Explosive effect
viii) psychological effect of disagreeable odors

4. Mode of entry and absorption of chemical substances

i) Resp tract ~ upper / lower ~ systemic or
ii) Digestive tract ~ First pass thru liver - may be detoxified.
iii) Skin - intact / damaged ~ fat soluble more than water soluble

5 Individual tolerance to chemical contaminants

i) Variations in physio functioning
ii) " in biochemical reactions
iii) " in anatomical structure
iv) Genetic variations
v) Nutrition
vi) Alcoholism - effect on liver susceptibility.

6. Role of Sex, Age, Race in tolerance

i) Sex difference not venable.
ii) Race only important in dermatoses
iii) Age - young people thought to be more sensitive to chemicals rather than old.

7 Effect of concentration and duration of exposure

Harmful effects increase ē
i) increase in concentration
ii) " in duration of exposure
iii) Also dependent on
rate of absorption
rate of excretion
rate of detoxification
rate of retention

8. Maximum allowable concentration of chemical substances in Air

i) M.a.c
ii) T.L.V.

Basis i) industrial experience
ii) Experimental studies a) animal b) human
Values for eight hour working day exposure without injury to health.
c) Sensory response of individual
d) concentrations in air samples
e) Corelating concentrations in work place ē results of Clinical & lab examinations of workers

All the above procedures (a) to (e) have their individual drawbacks
Also in the in industry the substance may be used as a mixture in combination ē other chemicals thus making application of lab findings more difficult

9. Analysis of Chemical Substance in Air.

i) Different methods

10. Methods of expressing concentration of chemical substances in air

Hard rock dust = no of particles / cu. ft of air
Metallic dusts / fumes = mgm / cu. metre of air
Gases & vapor = ppm parts of air by volume or mgm / litre

$$\text{mg./litre} = \frac{\text{gram mol. wt} \times \text{ppm}}{22{,}400} \quad (0^\circ C)$$

(11) Dusts - Classification

Based on principle effects

i) Pneumoconiosis producing dusts
ii) Allergic dusts - plant & animal, or origin
iii) Metallic/Inorganic toxic dusts & fume.
iv) Dusts from organic material

Based on tissue effects

i) Absorptive - $CaCO_3$, gypsum, cement (calcite, limestone)
ii) Relatively inert. - Hematite, feldspar, Carborundum, Soapstone, Siderosis
iii) Fibrosis producing - Silica, asbestos.

Pneumoconiosis

i) Benign / malignant
ii) Specific / non specific

(12) Metals - their dusts/fumes/vapors

i) Metallic dusts & fumes (harmless)
Iron, silver, Ru, Mb, gallium.
ii) Metallic fumes → Metal fume fever
Oxides of Zn & Mg, other oxides
iii) Metallic dusts/fumes irritative to Resp Tract.
Be, Cd, Cr, Mn, Ni, Pl. Vd
iv) Effect on skin - Pl, Antimony, Ba, Be, Ca, Cr, Cu, Mg, Hg, Ni, K, Ag. Na, Zn.
v) Absorbed & harmful effects on internal organs
Sb, Be, Pb, Mn, Hg, Radioactive materials, Thallium, Uranium, Vd.

(13) Gases in the air - Classification

i) Natural gases. O_2, N_2, CO_2
ii) Asphyxiant gases. CO.
iii) Irritant gases - PH_3, N_2O, NO, SO_2, Cl, HF, NH_3, O_3
iv) Toxic gases - HCN, H_2S, CS_2, AsH_3, Nickel Carbonyl.
v) Narcotising gases - Nitrous oxide. Halothane etc.

(14) Organic Compounds

i) Aliphatic hydrocarbons - benzene
ii) Organic acids
iii) Esters, Ethers, Aldehydes, Ketones
iv) Alcohols - eg Methyl alcohol
v) Glycols, their esters/ethers - Diethylene glycol, Dioxane
vi) Chlorinated hydrocarbons - CCl_4, Trichloroethylene, Tetrachloroethane, ethylene dichl.
vii) Nitro/Amino compounds of the aliphatic series - nitroparaffin, nitriles, vinyl cyanide
viii) Aromatic Hydrocarbons & their chloride/hydroxyl derivative (benzene, toluene, xylene, naphthalene)
ix) Aromatic nitro/amino compounds (aniline, mono & dinitro benzene, TNT, dinitrophenol, beta naphthylamine)
x) Organic insecticides organochlorines/organophosphates

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(15) Insecticidal Toxicity — Ref. RI Booklet & ICMR-SBS
(16) Occupational Carcinogens — Ref EMAS Notes
(17) Occupational Dermatoses

i) Protective mechanisms of Skin
ii) Factors disposing
a) Nature of agent
b) Duration of exposure
c) Presence of other lesions/diseases
d) Lack of personal hygiene
e) Type of skin - oily, dry
f) Age of individual.
g) Sex of individual
h) Climate, summer/winter - amt of clothing
i) Sweat output etc.

iii) Causes classification
a) Physical Factors/Mechanical
b) Biological agents
c) Primary irritants
d) Sensitisers

Primary irritants - causes dermatitis by direct action at site of contact if permitted to act in sufficient intensity/ quantity / length of time.

Direct chemical / Physical action

i) Dissolving keratin - alkalies or soaps
ii) Dissolving fat/cholesterol - organic solvent
iii) Dehydrating tissue - inorganic acids & anhydride
iv) ppt'n of proteins - heavy metal salts
v) oxidation of cells - bleaches or chromate
vi) Action as reducing agents - organic acid
vii) Keratogenic action - coal tar, petroleum product

Secondary irritants or Sensitisers

i) Synthetic dye intermediates
ii) Explosives - TNT, Tetryl
iii) photo developers
iv) formaldehyde.
v) some insecticides / fungicide
vi) rosins, synthetic resins / waxes
vii) most plants such as poison ivy
viii) cashew nut oil

Characteristic of lesion - non specific

Diagnosis - i) Relationship to employment
- post employment
- develops during course
- improves when away from work
- reappears on re exposure
ii) Location & characters of lesion
iii) patch test

Prevention:

i) Elimination of contact.
ii) Personal protective measures
a) protective clothing
b) protective ointments
c) personal cleanliness
iii) Preemployment & periodic exam.
iv) Health Education

(18) General Measures for Prevention of Occup. Diseases due to Chemical substances

Environmental control

1) Substitution of material
2) Total enclosure
3) Local exhaust system
4) General ventilation
5) Wetting of dusts
6) Process control
7) Isolation & segregation of harmful operations
8) Good housekeeping
9) Plant & Equipment design
10) Upkeep of control Equipment
11) Periodic environmental survey

Personal control

12) Personal protective equipment
a) Resp. protective equipment
b) Eye protection
c) Skin protection
13) Personal Health habits and other personal procedures
a) personal cleanliness
b) Prevention of contamination of mouth.
c) No food / smoking at workplace
d) Nutritional status
e) Alcohol consumption.

Medical control

14) Exam'n of employees.
a) Pre placement
b) Periodic
c) Annual
15) Analysis of medical records
16) Knowledge of Plant process & material
17) Health Education
- Management
- Worker
- Labour union

2. Occupational Health (Hanlon)

Chapter 26

Definition "Occupational Medicine deals with the restoration and conservation of health in relation to work, working environment and maximum efficiency. It involves prevention, recognition and treatment of occupational disabilities and requires the application of special techniques in the field of rehabilitation, environmental hygiene, toxicology sanitation & human relations"

(Council on Industrial Health American Med. Assn)

Four types of recourse against undesirable conditions of work

1. Strikes
2. Disability compensation

] neither are true solutions

3. Labor-management arbitration.
4. Cooperative preventive planning and action by public health agency, labor and industry.

Benefits of O.H. Programme

1. Healthy, happy worker, more dependable, high morale and pride in work.
2. Reduction in i) absenteeism
   ii) labour turnover
   iii) incidences of occupational illness/injury.
3. Diminution in employee grievances
4. Improved employee relations
5. Improved public relations
6. Increased worker and community pride in company and its products
7. Enhanced appeal and advertising value of a clean plant, healthy contented employees and a sanitary product.

How:

1. Built in safety measures
2. Health Education & Motivation of workers
3. Gradual and selective return to work consistent = illness
4. Persuasion of worker to seek preventive and curative remedy early
5. Effective & appropriate techniques for detection/handling of malingerers
6. Link between worker's health & [illegible] health & social

Objectives of an Industrial Health Programme

Ref: Cameron D.C - Human relations in Occupational Health
Public Health Reports 67: 686 July 1952.

1. The assessment of a workers physical and psychological assets as well as his liabilities, to facilitate proper selection & placement
2. The prevention of occupational / non-occupational illness
3. The provision of treatment, the type and extent of which depends on the policy of the organisation
4. The fostering of a personal, physical, mental and social ability to work and enjoy life beyond the mere absence of disease or infirmity

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Services of an Occupational Health Department

1. Regular appraisal of plant sanitation
2. Periodic inspection for occupational disease hazards
3. Adoption & maintenance of adequate control measures
4. Provision of first aid & emergency services
5. Prompt & early Rx for all illnesses resulting from occupational exposure
6. Reference to the family physician of individuals with conditions needing attention, cooperating with the patient and physician in every practical way to remedy the condition
7. Uniform recording of absenteeism due to all types of disability
8. Impartial health appraisal of workers
9. Provision of rehabilitation services within industry
10. The conduct of a beneficial health education programme

Expectation of Management from Health Services

1. Availability of services - speed, quality and quantity balanced
2. Uniformity of advice, standards, methods
3. Accuracy - evaluation based on technical data or mature experience
4. Clarity - clear reports with understandable terminology
5. Practicality - recommendations economically feasible.
6. Palatability - recommendations in persuasive language
7. Tact in conduct of investigations to prevent fears, suspicion or misunderstanding

in Health Education.

10. Balance - representation of pertinent professions needed for an adequate program

Ref.
Winslow Am. J. Public Health 37: 1338 Oct 1947.
" Administrative Problems of Industrial Medicine"

=

Occupational Health — Leavell & Clark
Chapter 12

Levels of Prevention

1. Health Promotion
   i) Fitting jobs to workers
   ii) Health Counselling
   iii) Mental health
   iv) Env Health promotion
   v) Physiologic machine design
   vi) Plant hygiene
   vii) Worker hygiene

2 Specific protection
   i) Toxic hazards Skin
      Resp system.
   ii) Atomic energy
   iii) Accident prevention a) Engineering
      b) Education

3 Early A & prompt Rx
4 Disability related to occupation
— Non occupational disability
— C.D.C
4. Disability Limitation
5 Rehabilitation

OCCUPATIONAL AND MENTAL HEALTH IN INDUSTRY

Topic: General Survey of Occupational Health Problems in Indian Industry.

1. The Working Population in India (1971 Census)
2. Major Industry groups in India
3. Types of Hazards
4. Predisposing/Precipitating factors in the Indian Environment
5. Medical Problems
6. Industrial Accidents
7. O.H Hazards (Magnitude)

The Working Population in India (1971 Census)

Categories	Total Workers in '000	Percentage
1. Cultivator.	78,176	43·34
2. Agricultural labourer.	47,489	26·33
3. Plantations, Livestock and Forestry.	4296	2·38
4. Mining and quarrying	922	0·51
5. Manufacturing, processing and repair	17066	
a) Household	6351	3·52
b) Other than household	10715	5·94

		in '000	Percentages
6	Construction	2215	1.23
7.	Trade and Commerce	10,038	5.57
8	Transport, storage and Communications	4,401	2.44
9	Other Services	15,765	8.74

Major Industry Groups in India

	1970 (Nos in '000)
1. Processes allied to Agriculture - (Gins and Presses)	141
2. Food a) Sugar b) Rice mills c) Edible oils d) Tea factories e) Cashewnut	675
3. Beverage	18
4. Tobacco	121
5. Textiles a) Cotton b) Jute c) Silk mills	1249
6. Footwear and Wearing apparel	63
7. Wood and Cork	87
8. Furniture and Fixtures	16
9. Paper and Paper products	70
10. Printing / Publishing	139
11. Leather and Leather products	25
12. Rubber and Rubber products	70
13. Chemical and Chemical Products (Artificial manure, Heavy chemicals Pharmaceuticals, Matches)	246

14.	Products of Petroleum and Coal	24
15	Non-metallic mineral products Bricks + Tiles, Glass + glass products, cement mica factories	259
16	Basic metal industries a) Iron + steel b) basic Rolling (ferrous) c) Tough casting (ferrous)	268
17	Metal products	211
18	Machinery	360
19	Electrical Machinery	204
20.	Transport equipment Railways / Motor Vehicles	494
21.	Miscellaneous industry	175
22	Electricity, Gas and Steam	62
23	Water and Sanitary services	10
24	Recreation services	3
25	Personal services	7

Industrial Accidents

(1) Magnitude of Problem (1974)

Estimated Average daily employment	5.5 million
No of working factories	96,000
Total No of injuries	2,44,507
Frequency rate of injuries per one lakh mandays worked.	19
Rate of injuries per 1000 workers	54.74

(2) Frequency rate of Accidents in different industries (1971)

Jute Hemp and Textiles	101.10
Cotton Textiles	64.65
Transport equipment and parts	25.49

Machinery, machine tools and parts	20.44
Metal products	19.90
Leather, Leather products	18.49
Paper and paper products, printing and publishing	14.12
Non-metallic mineral products	14.02
Electrical Machinery	20.59
Wool / Silk / synthetic fibre products	12.67
Chemical and Chemical products	12.03
Beverages / Tobacco	11.78

3. Percentage-wise distribution of Accidents by causes (1971)

Machinery	32.83	Hand Tools	9.62
Handling	12.30		

Accident causes (contd)

Falling bodies	9.25
Stepping on or striking objects	9.22
Persons falling	4.66
Molten metals, Hot & corrosive substances	2.82
Transport	1.51
Electricity	0.32
Gassing	0.27
Fires	0.25
Explosions	0.08
Others	16.87

Magnitude of Problem based on Surveys of CLI/NIOH etc

(1) Silicosis

a) Hand drillers in Mica Mines of Bihar
   2.7% were suffering from silicosis
   18.6% " " " pulmonary T.B

b) Workers (Female) in ceramic and pottery industries
   11% had silicosis

c) Pottery workers on All India basis
   15.7% showed endence of nodular silicosis

d) Lead and zinc miners of Rajasthan
   30.4% of population showed radiological evidence of Silicosis

e) Metal grinders survey - 27% suffered from silicosis

(2) Coal Miners Pneumoconiosis

f) Coal Miners of Jharia and Raniganj.
18·8% showed radiological evidence of pneumoconiosis

(3) Lead industries
10·6% showed clinical signs and symptoms
48·7% showed undesirable blood levels

25·6% of Hand compositors in printing presses of Bihar showed signs/symptoms of Lead poisoning

(4) Manganese Poisoning in Ferro manganese plants
73% completely disabled

16.8% Partially disabled
10.6% Symptoms only

(5) Visual Problems

a) Textile / Engineering industries - 38% of cases had clinical problems

b) Welding industries
66% complained of eye symptoms
conjunctivitis / Keratitis, cataract etc
15.6% had visual standards below normal

c) Coal Mines - 29.06% of workers examined had eye diseases

(6) Chromium Poisoning - Dichromate manufacturing industries
19-20% had skin infections / ulcerations
20-21% had nasal mucosa ulceration / nasal cartilage perforation

Refer to Cataract infect. Glaucoma N plug.

⑦ Hearing impairment

a) 50% of workers in a Nitric acid plant showed poor hearing

Industries Represented on the Course

Heavy Electricals.

Oil Refinery.

Petrochemical. Methanol / Ethanol / Naphthalene / Benzene / Toluene
Ammonia / Gasoline / CS_2.

Steel

Ship builders / Engineers

Dock workers (Mar 78 I J Ind Med) Dermatitis, Cataract, Pterygium

Hindustan Aeronautics

Construction / Heavy Machinery

Electrical Appliances

Locomotives / Transport

Aluminium

Heavy Engineering

TYPES OF HAZARD AT WORK

(1) Physical
- i) Ventilation
- ii) Temperatures
- iii) Illumination
- iv) Noise.
- v) Vibration
- vi) Radiation
- vii) Electricity

(2) Chemical
- i) Inorganic metals and salts
- ii) organic compounds
- iii) Dusts a) Mineral
  b) vegetables
- iv) Gases and fumes

(3) Biological i) Bacterial
ii) Viral
iii) Parasitic
iv) Others

(4) Mechanical Hazards or Accident Risks

(5) Psychosocial Hazards
Mental Stress
Anxiety
Boredom
Poor interpersonal relationships etc.

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(5) Psychosocial Hazards
Mental Stress
Anxiety
Boredom
Poor interpersonal relationships etc.

- PREDISPOSING / PRECIPITATING / COMPLICATING FACTORS IN THE INDIAN ENVIRONMENT.

1. Environment
   a) Poverty / Housing / Env. Sanitation
   b) Climatic conditions
      Heat, Humidity
   c) Biological hazards
      infective / parasitic
      communicable diseases

2. The Worker
   a) Poor Nutritional status
   b) Illiteracy or low level of education
   c) Skin pigmentation
   d) Enzyme deficiencies (inherited)
      (Population genetics)
   e) Religious / Social / Cultural factors affecting / modifying his behavioural patterns – diet, attitudes etc.
   f) Poor personal hygiene.

3. The Process of Industrialization

a) Recent Process - First generation workers
- low Technical / Technological experience

b) Ergonomics problems - due to borrowed Technology and machines based on Western anthropometric measurements and Western environmental conditions

c) Certain amount of built-in protection since later designs - often lull our doctors / engineers in believing that our workers are in safer environment.

4. Poor Recording Systems - Quantification of problem Magnitude / severity not available for priority setting and service programmes

Important Medical Problems – due to these hazards

1. Symptomatic conditions – Metal fume fevers, Beat condition Venosymonits Raynauds phenomenon nystagmus etc
2. Pneumoconiosis – Silicosis, Byssinosis, Bagassosis Asbestosis, Farmers lung
3. Asthma – Isocyanates, platinum, osmium iridium, phenylenediamine, hard woods
4. Occupational cancers Asbestos, Smoke, Chromium Arsenic Nickel, Uranium. Ionising Radiation (Naphthylamine Benzidine), Dyes, Wood dusts, Benzene, Coal Tar and its products
5. Industrial dermatitis Mineral oils, organic solvents degreasers, acids, alkalies, glues, resins hardeners, accelerators, metals (nickel and chrome) Heat, cold, Kauma, xray, ionising radiations

Bacterial, viral, fungal infection and parasitic infestations

Primary irritants and secondary irritants

6 Ophthalmic conditions
Conjunctivitis + Keratitis
Corneal dystrophy,
Glaucopsia (blue grey vision)
Lens changes / Cataracts
Optical neuritis, Retinal changes (lasers)
Atrophy of visual retext (Mercurial alkyl compds)
Eye strain
Nystagmus
Arc Eye
Diplopia
Constriction of visual fields

7 Peripheral Neuropathies
Arsenic, Lead, Mercury, Bismuth, organophosphorous organochlorine compounds, DDT, parathion, dieldrin
Silver, thallium, CO, CS_2, trichloroethylene

Peripheral neuropathies - dinitrophenol, isoniazid
contd methyl alcohol, methyl bromide
acrylamide

8. Behavioural disorders Lead, Mercury, methyl chloride
Bromide, Manganese compounds
trichlorethylene

9. Parkinsonism - Manganese, CS_2, CO

10. MI type disease - CS_2.

11. Noise induced deafness - also fatigue, nervousness
mental inefficiency, indigestion

12. Blood dyscrasias Lead, benzene