



Institute of
Biomedical
Science

Laboratory-Acquired Infections: History of Prevention



Robert Koch, Nobel Laureate in Physiology or Medicine.

Three incidences of infection in healthcare workers led to the Department of Health and the British Government setting up a number of working parties, recommendations and legislation concerning the prevention of laboratory-acquired infections (LAIs).

THE PATH OF LEGISLATION

The outbreaks of hepatitis and smallpox mentioned in Paster 1 are two instances that prompted legislation. In 1957, Reid reported the incidence of TB in laboratory workers. The highest incidence was in those who handled sputum and discharges. A breakdown of figures is shown below:

- 2.8/1000 among all staff
- 1.9/1000 among chief technicians
- 2.2/1000 in basic grade technicians
- 4.2/1000 in junior technicians
- 5.0/1000 in student technicians
- 9.1/1000 in marbury attendants

THOMLINSON REPORT (1958)

- Focused on the excess incidence of TB mortality in laboratory and PM room staff, who also had the highest rate of doubling TB.
- Gave advice on the active preventative precautions to be taken in laboratories, PM rooms and in animal houses.

ROSENHEIM REPORT (1972)

- The investigation of the Edinburgh hepatitis B outbreak led to a review of the precautions to be taken in renal dialysis units to prevent the spread of this virus. It included advice on the precautions to be taken in laboratories.
- This was followed by the Maycock Report (1973) giving further and updated advice.
- These were further updated and expanded in 2002 to include hepatitis C and HIV.

SAFETY IN PATHOLOGY LABORATORIES (1972)

- JF Haggie's working party produced this booklet containing advice for laboratories.
- This was further developed by the Public Health Laboratory Service (PHLS) Monograph No. 6 in 1974 - *The Prevention of Laboratory Acquired Infections* authored by C R Collins FRMS.

GOBBER REPORT (1974)

- This report continued advice on the safety precautions to be taken by staff handling Category A pathogens (now Group 4) and their classification.
- Recommended the classification of other pathogens as either B or C.
- Prompted by outbreaks of Marburg ogget and Lassa fever, it recommended the establishment of the Dangerous Pathogens Advisory Group (DPAG).
- The DPAG published a Code of Practice for handling samples that may contain Category A pathogens.
- The Department of Health began to take the incidence of LAIs seriously and set up a working party led by Professor Sir James Hovine.

The Gobber Report continued working on the safety of personnel involved with what was then classed as category A (now Group 4) pathogens.

HEALTH AND SAFETY AT WORK ACT (1974)

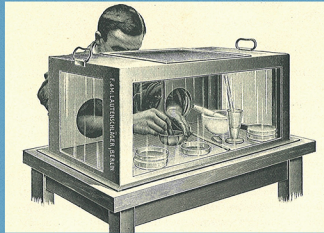
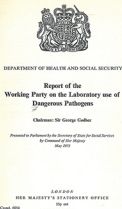
- Formation of Health and Safety Executive (HSE) which had the power to enforce legislation was enacted in the work place.
- In 1976 protection under the act extended to laboratory workers.
- Safety representative introduced. These had to be members of a Trades Union.

HOWIE REPORT AND CODE OF PRACTICE (1978)

- Categorisation of organisms into 1,2,3 and 4.
- Prepared a Code of Practice for specimens thought to contain hepatitis B virus.
- Defined the duties of a Safety Officer.
- Considered laboratory design to improve safety.
- Listed microbiological hazards.
- Required notification of LAIs.
- Set up safety committees.
- The Department of Health Building Note 15 gave advice on planning, building and equipping laboratories.

SHOOTER REPORT (1980)

- Inquiry into Birmingham smelting incident in 1978 (a year after the last known natural case in Somalia).
- Recommended that the responsibilities of the DAG be transferred to a new body The Advisory Committee on Dangerous Pathogens (ACDP).
- The ACDP issues regular updates and advice on newly discovered pathogens and new information on known ones.



Robert Koch was the first to describe a bio-containment cabinet in 1905.

CAUSES AND PREVENTION

PREVENTION OF LAIs

- In 1919 first laboratory safety manual published in Germany by Frickel recommended
 - wraparound laboratory gowns with long sleeves.
 - no eating in the laboratory
 - avoid mouth pipetting
 - decontamination of pipettes.

MOUTH PIPETTING

- Recognised by Paneth as a hazard who recommended a rubber balloon (rubber teat) so as to avoid mouth contact.
- However, pipette controlling devices were not substantially adopted until the 1950s.
- Studies by Phillips (1961) and Harrington and Shannon (1978) revealed that it was still widely practiced in 1960s.
- In 1964, 62% of laboratories still used this method.
- In 1977, 65% of laboratories in England & Wales and 35% in Scotland still mouth pipetted!

AEROSOL GENERATION

- Published reports by Phillips and Bordeny (1966) demonstrated that considerable aerosol generation occurred with the use of syringes and needles, and that aerosols occurred from pipettes especially when the last few drops were expelled.

BIOLOGICAL SAFETY CABINET (BSC)

- Cabinets were developed to protect workers from aerosols.
- 1905: the first was described by Robert Koch, followed by Frickel in 1915.
- 1919: first cabinet available commercially in Germany.
- 1940: Van der Erbe published first formal description of a BSC.
- 1948: introduction of stainless-steel cabinets, with a glass viewing panel and exhaust fan.
- Not widely used in Britain until 1960s.

CENTRIFUGES

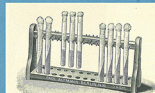
- In 1946 Reiman and Wendum noted major contamination of the environment following a leakage in a centrifuge.
- Number of cases small but could involve large numbers of people.
- Recommended sealed buckets to contain aerosols.
- Introduced to UK in early 1970s but not widely accepted or used.
- A sealed rotor was used as an alternative but this did not prevent contamination of other tubes in the machine.

NEEDLES AND SYRINGES

- Danger from aerosols from pressure in the syringe, and sick injuries.
- Merges (1957) suggested keeping hand behind needles.
- Removal of needles with forceps was recommended before introduction of sharps containers with needle-removing device.

BACTERIOLOGICAL LOOPS

- Risk of splatter when flaming wire loops which contaminated area with inadequately sterilised material.
- Before the introduction of disposable plastic loops and needles, it was recommended
 - that loops be no more than 5-6cm long
 - use of electrical incinerators or Bunsen hoses that enclosed loop.



In the laboratory the highest incidences of LAIs occurred with the handling of infected sputum and other discharges.

DESIGN OF THE LABORATORY COAT

- Fricker's gown was not widely adopted in Britain.
- Generally, the white coat used in laboratories gave little protection to work clothes. Loose sleeves could not be tucked over cultures and samples. Often unbuttoned, worn outside the laboratory, more uniform that protection.

DOWSETT-HEGGIE COAT

- Published in 1972 aimed at preventing LAIs and gave much better worker protection.
- Wasp round front, close fitting elasticated cuffs, poppers used as closures allowing rapid removal in emergencies.
- Current Laboratory coats are based on this design.

PERSONAL PROTECTION EQUIPMENT (PPE)

- In addition to BS, the reports above recommended the use of PPE when working with hazardous materials.
- Included are safety goggles, visors, latex or vinyl gloves, plastic aprons and disposable gowns.



Early personal protective clothing.



Early open centrifuge.

Occupational Health: Work and Play Can Make You Sick
Produced by the History Committee for Congress 2019