

Visit to Health Protection Agency virus lab at Colindale, 18 July03

Gate security takes photo of visitors

Proximity card detectors to enter laboratory area.

Hospital laboratories are normally BSL2. Using an biosafety cabinet that is open at the lower front but has an air flow.

BSL3 has negative pressure and HEPA filters. and is locked and sealed.

BSL4 Cabinet Lab

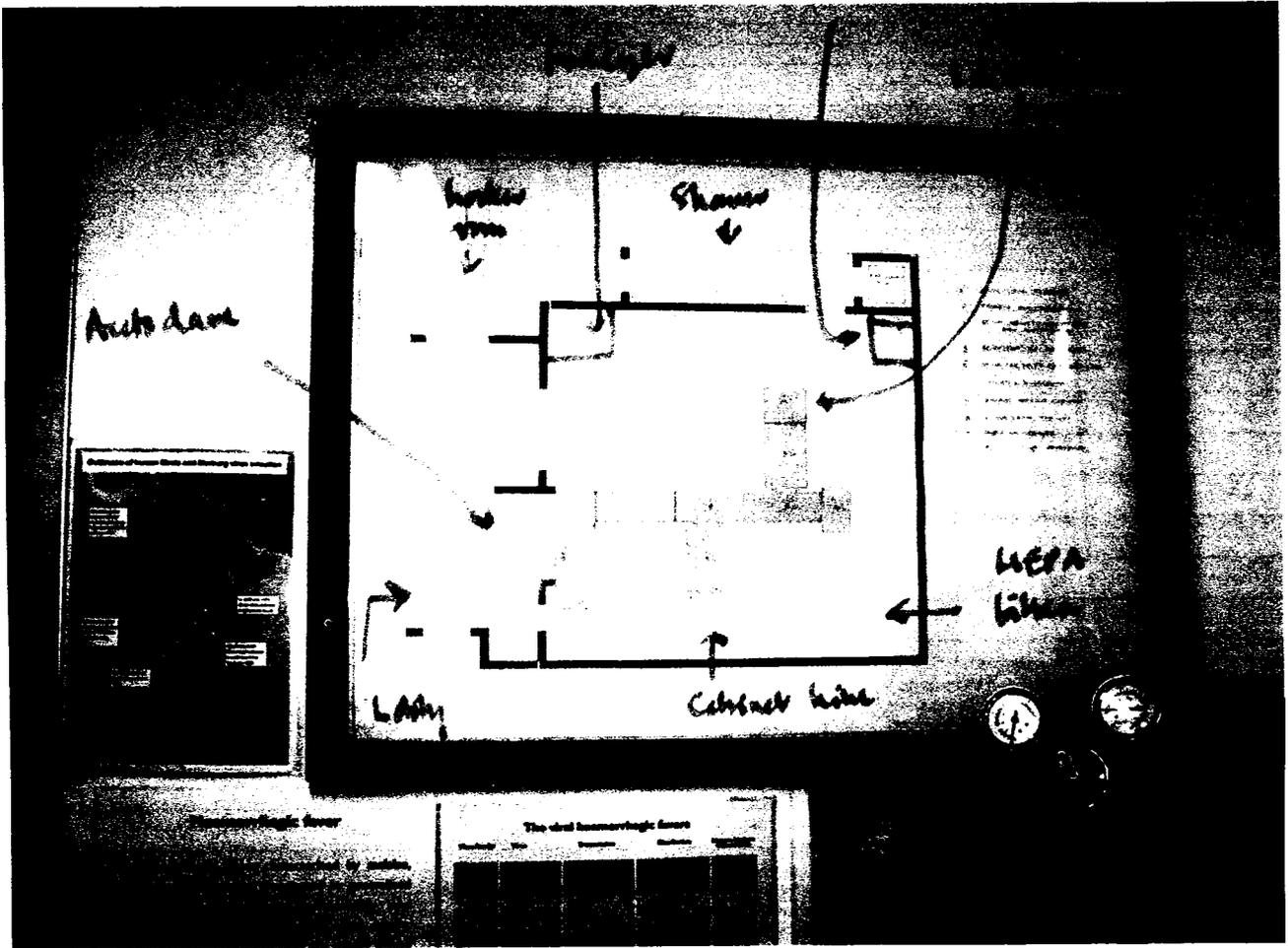
A further lock, using a simple code. There is a two-person rule, but it is not strictly kept. (For one thing, there is only one shower.) There are various personnel alarms, for example if a person stays in the shower for more than ten minutes. The lab is shut down every six months for servicing, including renewal of HEPA filters.

- 1) Entrance lobby.
 - a) Monitors for air pressure levels. There is a negative pressure gradient. Air pressure drops at each door. It is also lower in the cabinets than in the lab. The air handling equipment is above the ceiling. It has backup generators. The air pressure monitors are alarmed.
 - b) Autoclave. This looks like a big double-door stainless steel fridge with a safe-type opening mechanism and monitor lights and dials. This goes through the wall, so that that contaminated objects can but put in from inside a cabinet in the lab, autoclaved, then removed from the lobby. Autoclaving is heat and pressure. This destroys viruses and bacteria by coagulating the protein, like cooking eggs. There are standard temperature-pressure combinations known to be effective.
 - c) Monitors for Effluent Sterilization Vessels. Under the floor, all liquid waste from the lab is collected and autoclaved.
 - d) A Perspex emergency exit door from the lab
 - e) A regular door into the locker room
- 2) Locker room. Change into disposable socks, underwear, and overalls, all made of coated paper. Also white wellies. A Fire Exit window which is security alarmed.
- 3) Shower. For use on the way out. Soap and water only. Paper towels. Five minutes compulsory.
- 4) The lab itself. When entering, put on latex surgical gloves then cotton gloves.
 - a) The cabinet line. Three cabinets along the central spine, and three branches off it.
 - i) Each cabinet is a Perspex-sided box on a stand. It has three holes on each side—two fitted with rubber gloves, one with a sealed hatch with knurled knob to open it. The cabinets intercommunicate but the side cabinets can be sealed off for independent work.
 - ii) Inside the cabinets are racks of coloured pipettes of different sizes, each having a volume gauge, plus disposable tips for same, plus racks for vials, and containers of tissue culture. Each cabinet also contains a Formalin vaporiser and a power outlet. Also thermocouple thermometers, like a mobile phone or a TV remote.
 - iii) Also built into the cabinet line:
 - (1) Microscope
 - (2) Fluorescent microscope
 - (3) Incubator
 - (4) Fridge

(5) Centrifuge

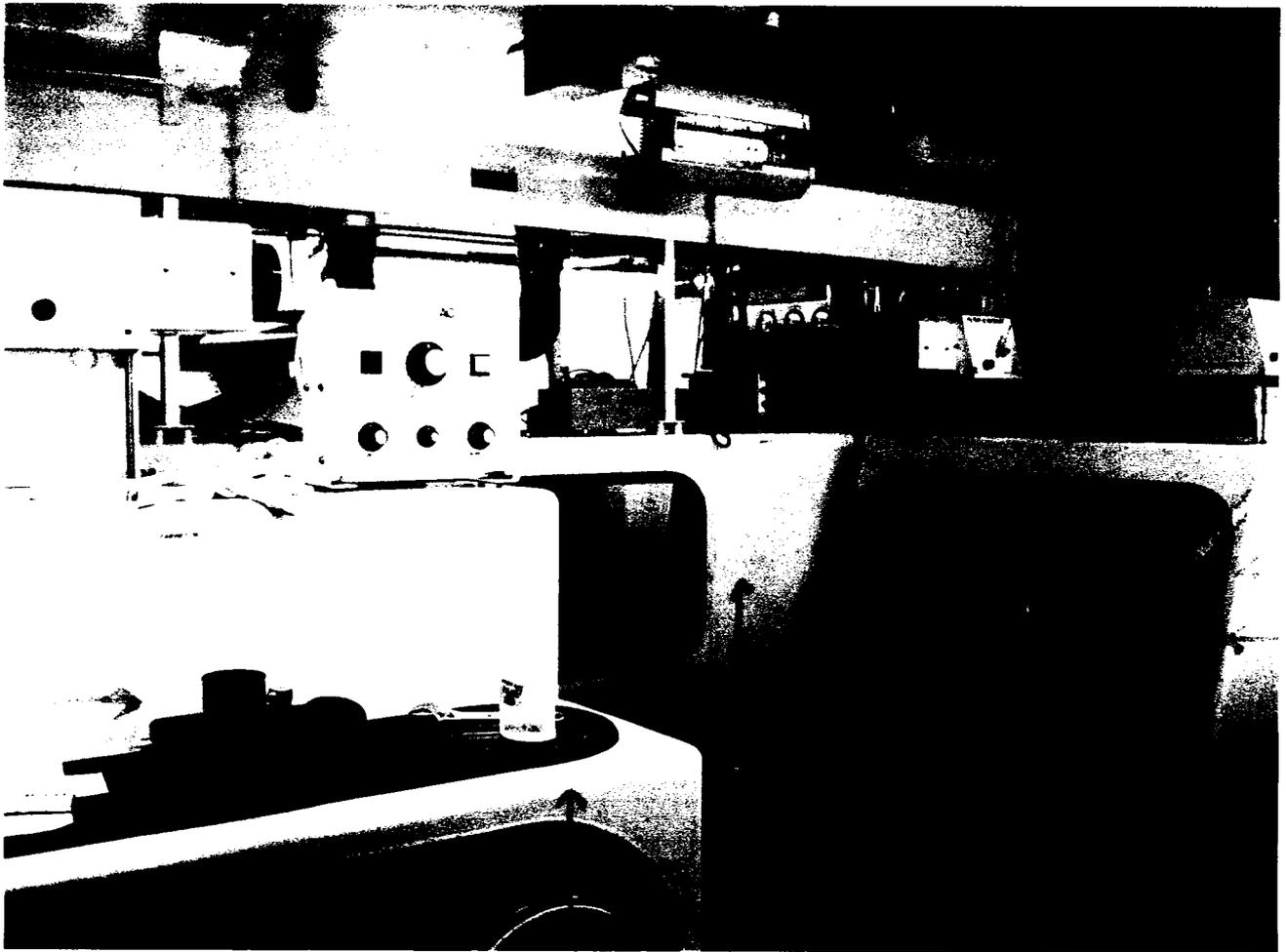
- iv) At the side of each cabinet is a hypochlorite dunk tank. Imagine you want to take a sample out of the cabinet. You put it in a sealed vial, then enclosed the vial in two sealed plastic bags. You put the bag in the dunk tank from inside, then remove it from outside. Chemicals destroy infective agents in the same way as autoclaving, by causing the protein coat to congeal (or sometimes by breaking the DNA or RNA chain). Radioactivity can also sterilize.
 - b) First thing in the morning, any samples to be tested would be put into the clean cabinet, through the porthole door. Then the experiments would be conducted. Afterwards, contaminated materials are put into a lollipop jar and passed along the line to the autoclave. Then the Formalin vaporiser is used to disinfect the cabinet.
 - c) Virus samples can be grown:
 - i) In tissue cultures. There is a separate tissue culture lab. Tissue cultures are grown and kept in lie-flat plastic bottles, rectangular in cross-section, with angled necks and coloured screw tops. The tissue consists of a monolayer covered by a liquid. Tissue is cultured in an incubator. The lab includes a level 1 cabinet for purity.
 - ii) By polymerase chain reaction, the best method. This amplifies the growth and takes only five hours.
 - iii) By destroying the protein coat and removing the nucleic acid.
 - iv) By looking for antibodies in the blood. A phosphorescent green halo around the infected cells. But it takes too long for the virus to bloom in the bloodstream.
- 5) When an individual becomes infected: First, risk assessment, cleaning. Then monitor the patient's temperature. The first sign of infection will be a rise in temperature. During this period he is not infectious, because the virus has not yet grown in him. But as soon as his temperature rises, give him (say) ribovarin, effective against Lassa virus, and take him to the isolation facility at Coppett's Wood, Muswell Hill, an outpost of the Royal Free Hospital which is a stand-alone building.
- a) Autoclave door
 - b) Two locked freezers for samples. (One freezer contains duplicates in case the first freezer breaks down.) Samples must be stored below minus 70 degrees C. RNA viruses are labile (easily destroyed).
 - i) Inside the freezer are racks of Sarsted vials (small tubes made of clear, freezable polystyrene, with a writeable white area on the side, and a screw cap with a black rubber seal called an O-ring). The vials contain samples.
 - (1) Samples are usually in liquid form. They may consist of blood, urine or saliva from patients.
 - (2) There are also pure samples of viruses grown in tissue culture, and samples of uninfected tissue, both for use as controls in tests. (Any test uses three samples: the patient sample; a sample of the tissue-grown virus; and a sample of uninfected tissue.)
 - (3) Each location is labelled. There is a log showing when samples are removed. The log is audited annually (although the scientists might notice discrepancies).
 - c) Two HEPA filters in series (compulsory in BSL4).
 - d) Fax machine and computer link: Paper may not be taken out of the lab.





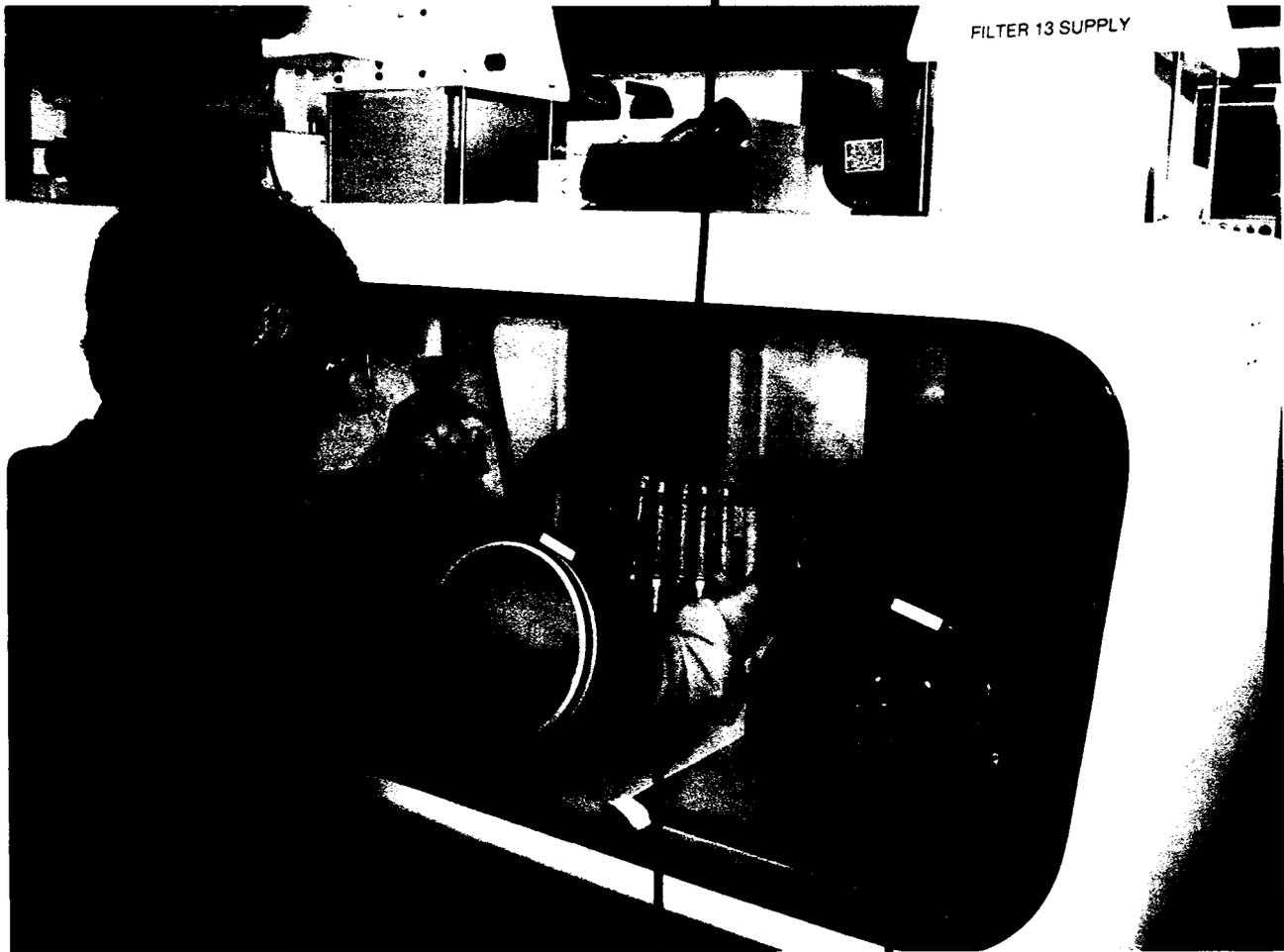






Biosafety cabinet

Pipettes rack



FILTER 13 SUPPLY

Glove

Porthole