The Royal Liverpool and Broadgreen University Hospitals NHS Trust

Isolators versus laminar flow for aseptic radiopharmacy work

Paul Maltby

Royal Liverpool & Broadgreen University Hospitals NHS Trust

Liverpool

Better together

Barrier Technology

- Vertical Laminar Flow Cabinets (class II safety cabinets)
- Isolators
  - Laminar flow
  - Turbulent flow
- Hot cell
  - Laminar flow
  - Turbulent flow

Barrier Technology

- Both VLFC and isolators can be negative pressure or ambient pressure (effectively re-circulating). Isolators could be positive pressure (*cf.* CIVAS)
- Hot cells are by definition negative pressure although a few ambient pressure models are available

Factors affecting choice of technology

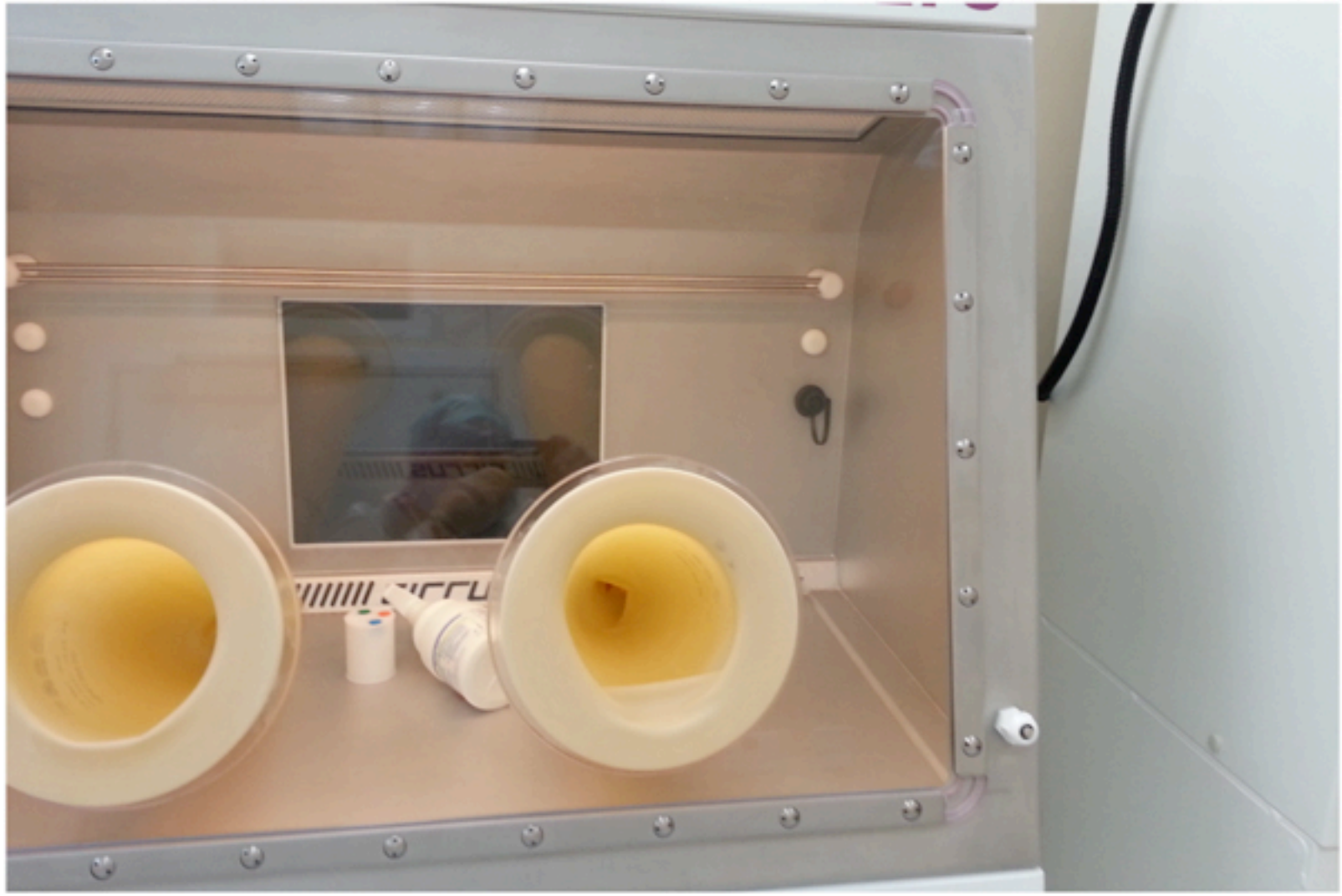
1. Health and Safety
   - Radiological
   - Biological
   - Ergonomic

2. Economics

2 –glove Technetium isolator

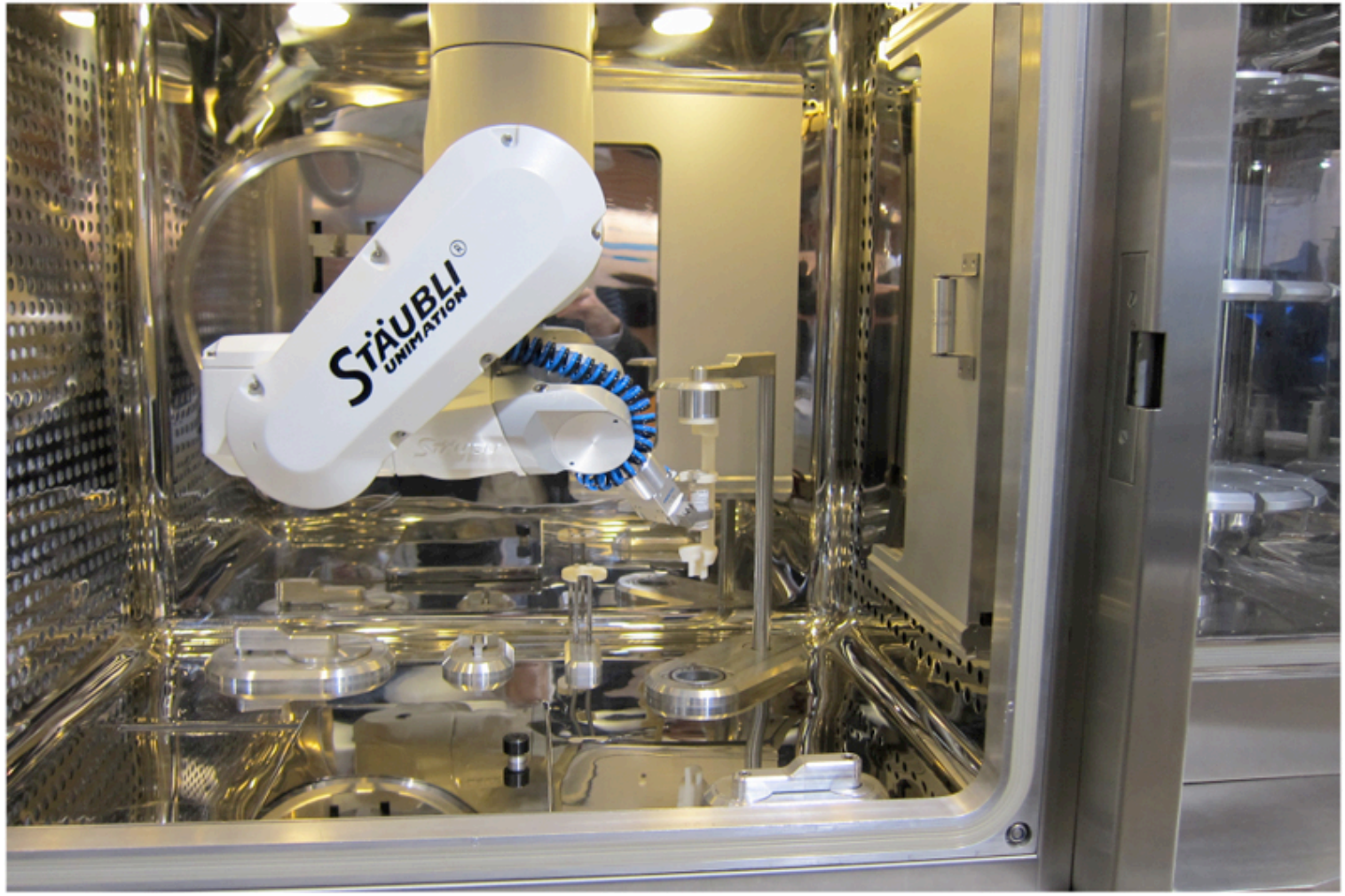
Transfer hatches – Can they be VHP?


AMERCARE

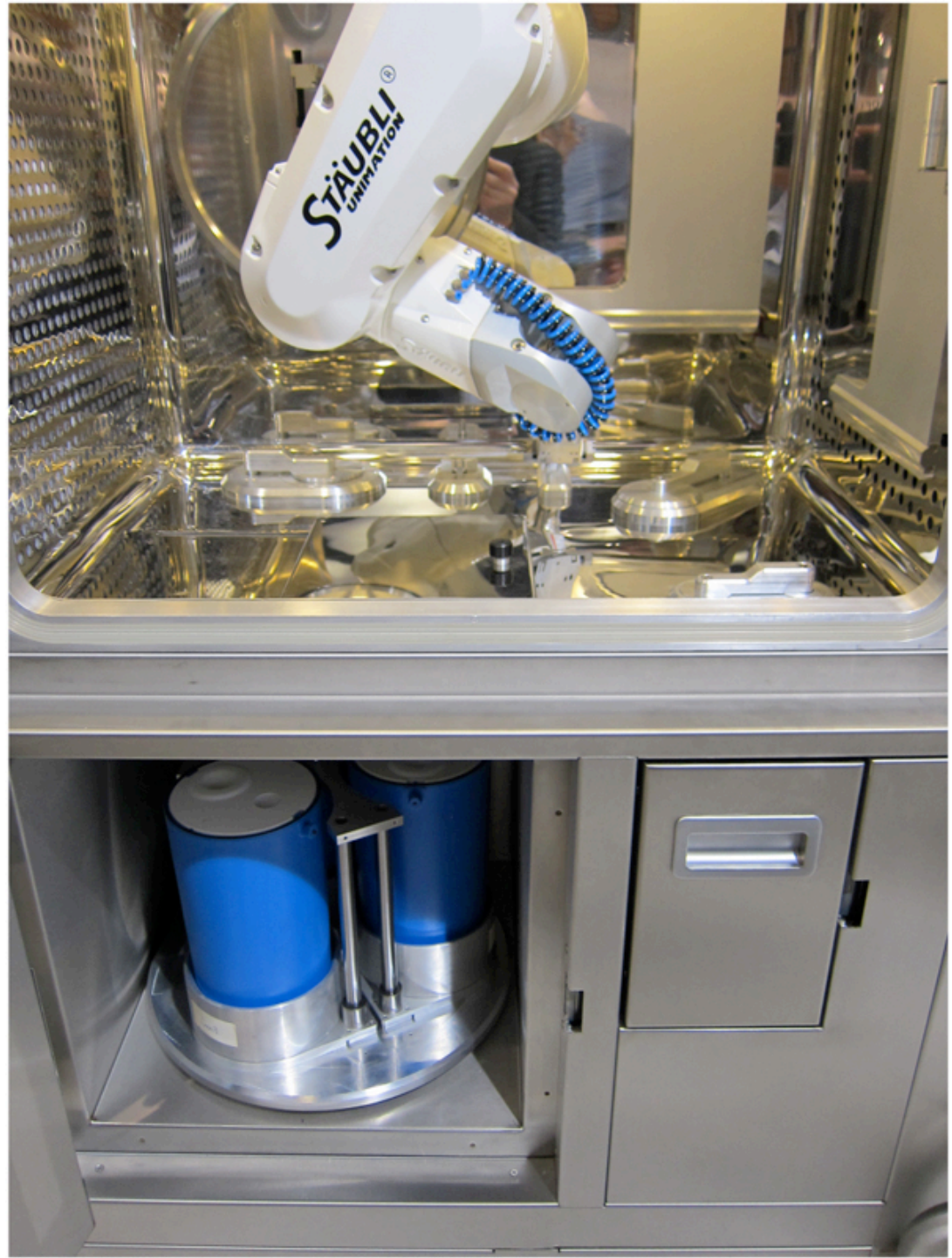


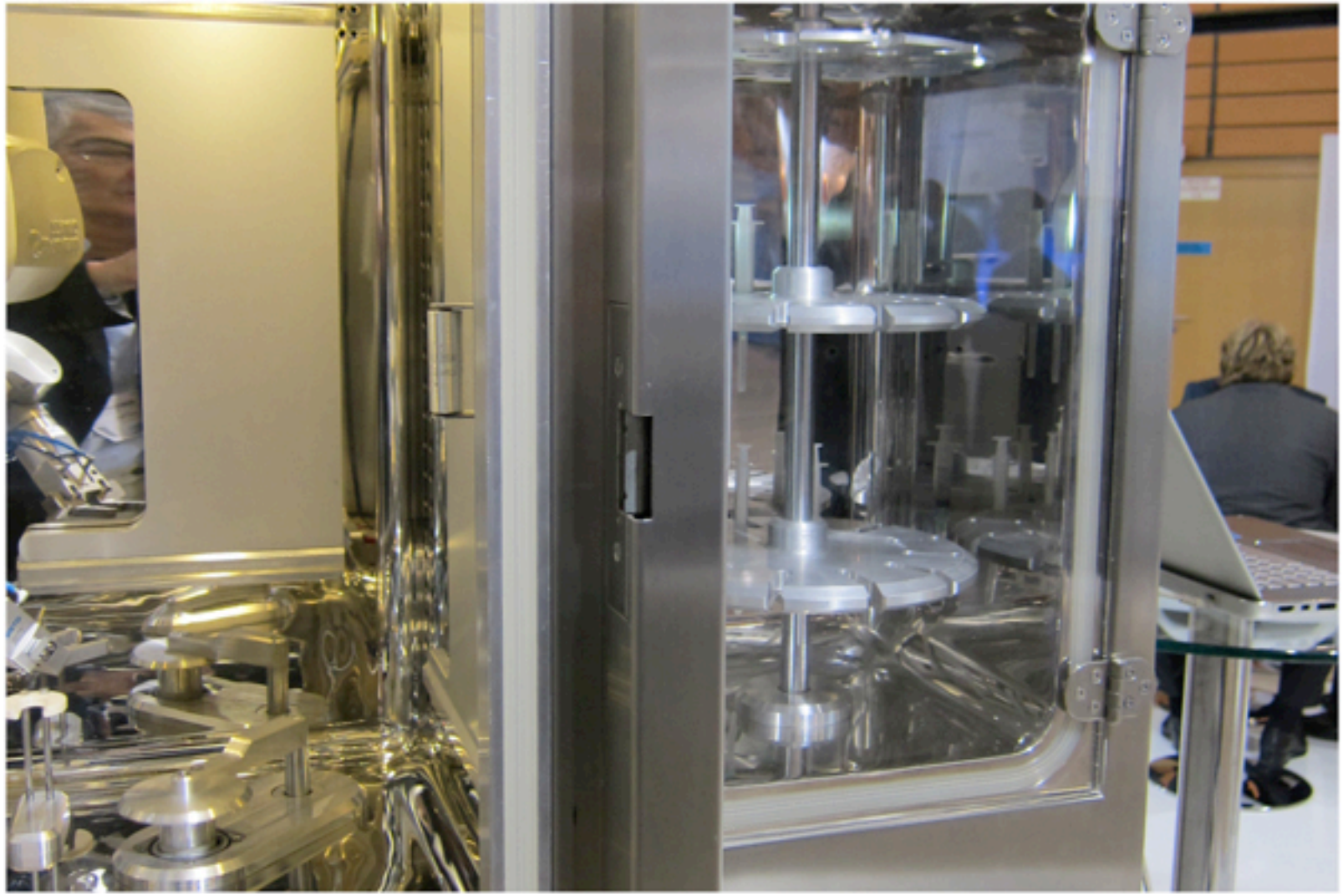
Touch screen for SOPs


cirrus



Automated Tc99m radiopharmacy in a double hot cell


STÄUBLI
UNIMATION



Transfer hatch for consumables and kits

Factors affecting choice of technology

1. Health and Safety
   - Radiological
   - Biological
   - Ergonomic

2. Economics

Radiological

- Therapy/diagnostic/PET
- Level of (radio)activity
- Half life
- chemistry

Radiological

- Diagnostic radionuclides for dispensing only

Diagnostic Radionuclides

- Acceptable to use LFC or isolator and can be re-circulating or extracting to the external environment.
- Local shielding eg lead perspex/glass and L barrier

Laminar Flow isolator – neutral

Lead glass “L” screen

Radiological

- Generators

VLFC grade A zone to elute
99mTc Generators

Single chamber transfer fromTc generator

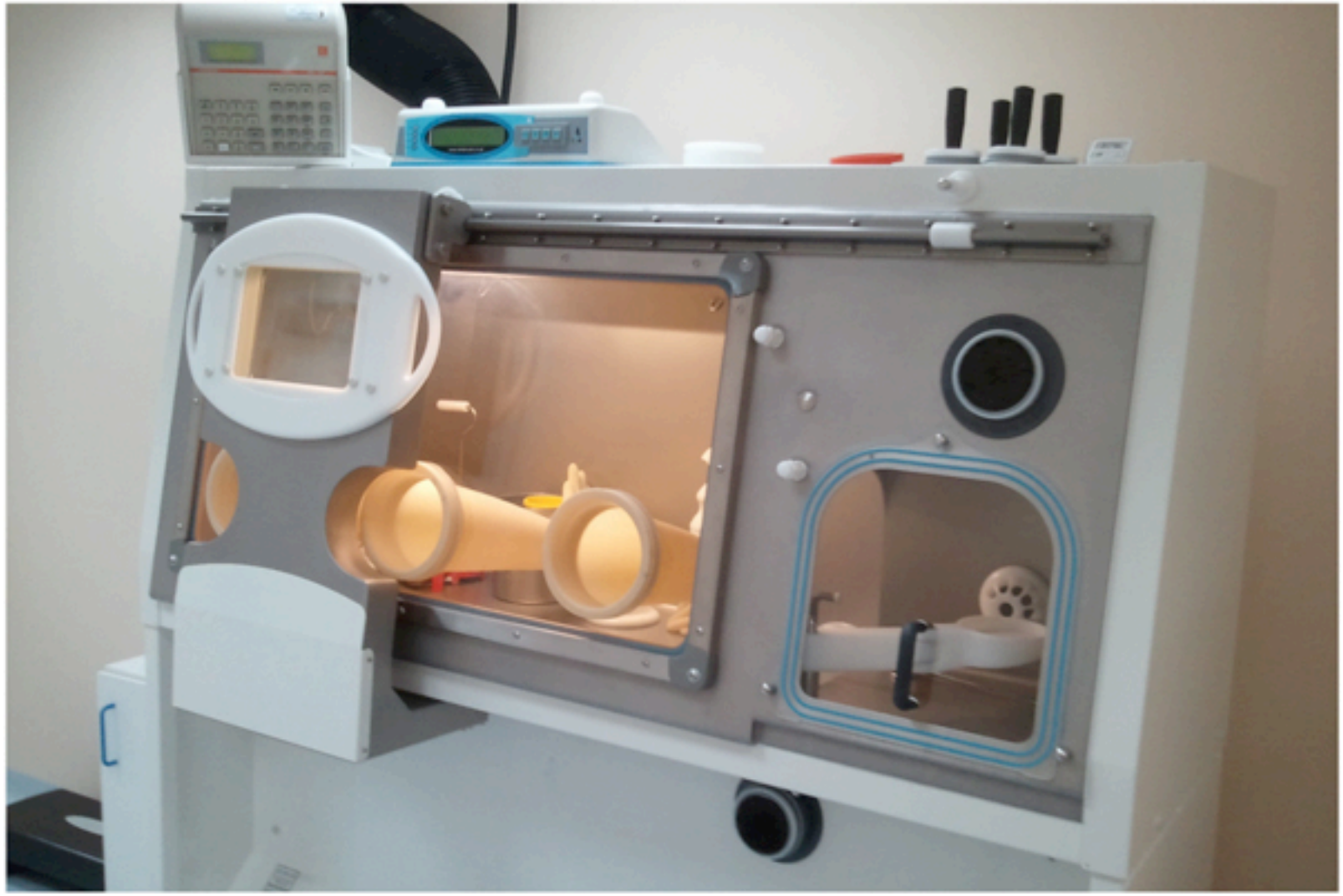
Dual chamber transfer from Tc generator

Environment for Generator – is it grade A?

Therapeutic and Positronic Radionuclides

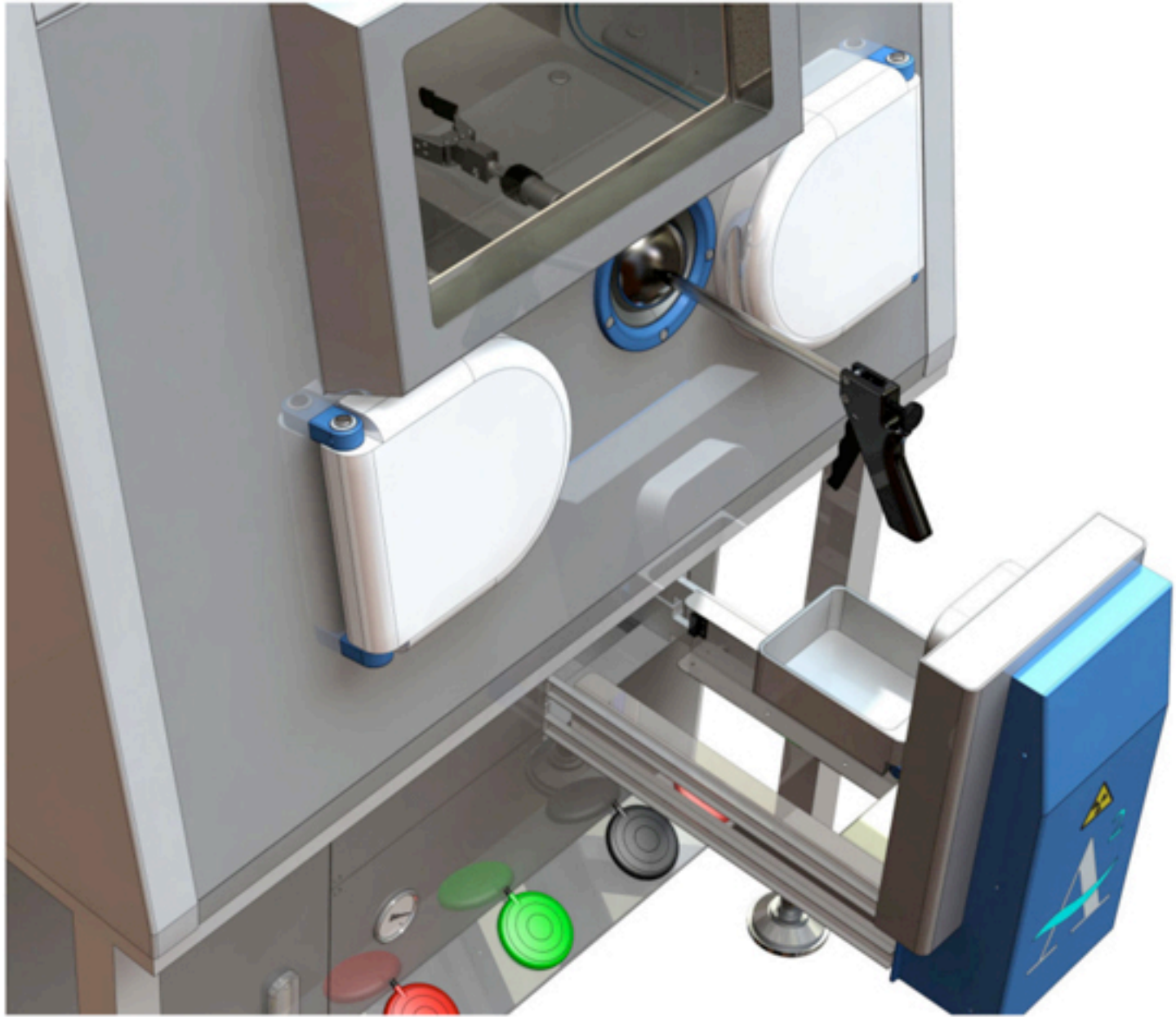
- Recommend heavily shielded isolator or hot cell and can be extracting to the external environment

(or re-circulating depending on radionuclide - *half life or volatility*)



Heavily Shielded Isolator 50mm Pb

Extracting heavily shielded isolator



Automatic loading and remote handling

Ga68 non-extracting hot cell

Ga68 Isolator with door open

Factors affecting choice of technology

1. Health and Safety
   - Radiological
   - Biological
   - Ergonomic
2. Economics

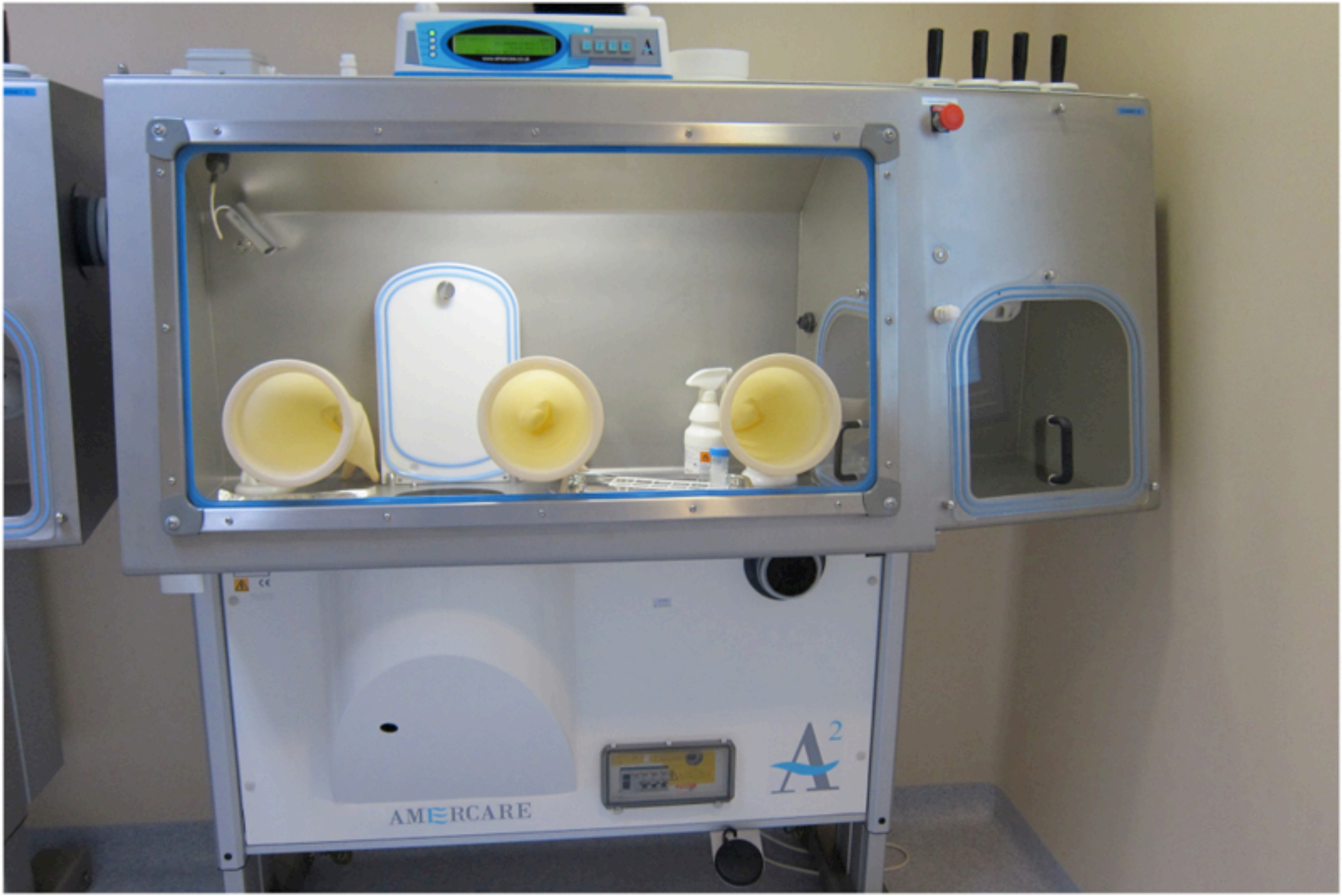
Biological

- Blood labelling
- Gene therapy monitoring
- Antibody

Biologicals

- Use negative pressure isolator preferably in a dedicated (separate) suite
- Gene therapy labelling suite may need separate AHU at negative pressure with respect to the radiopharmacy suite (at moment we are only labelling markers of gene expression)
- Antibody labelling goes from facile *(eg Leukoscan)* to therapeutic iodination

Built in centrifuge and dose calibrator


AMERCARE
A2

Factors affecting choice of technology

1. Health and Safety
   - Radiological
   - Biological
   - Ergonomic

2. Economics

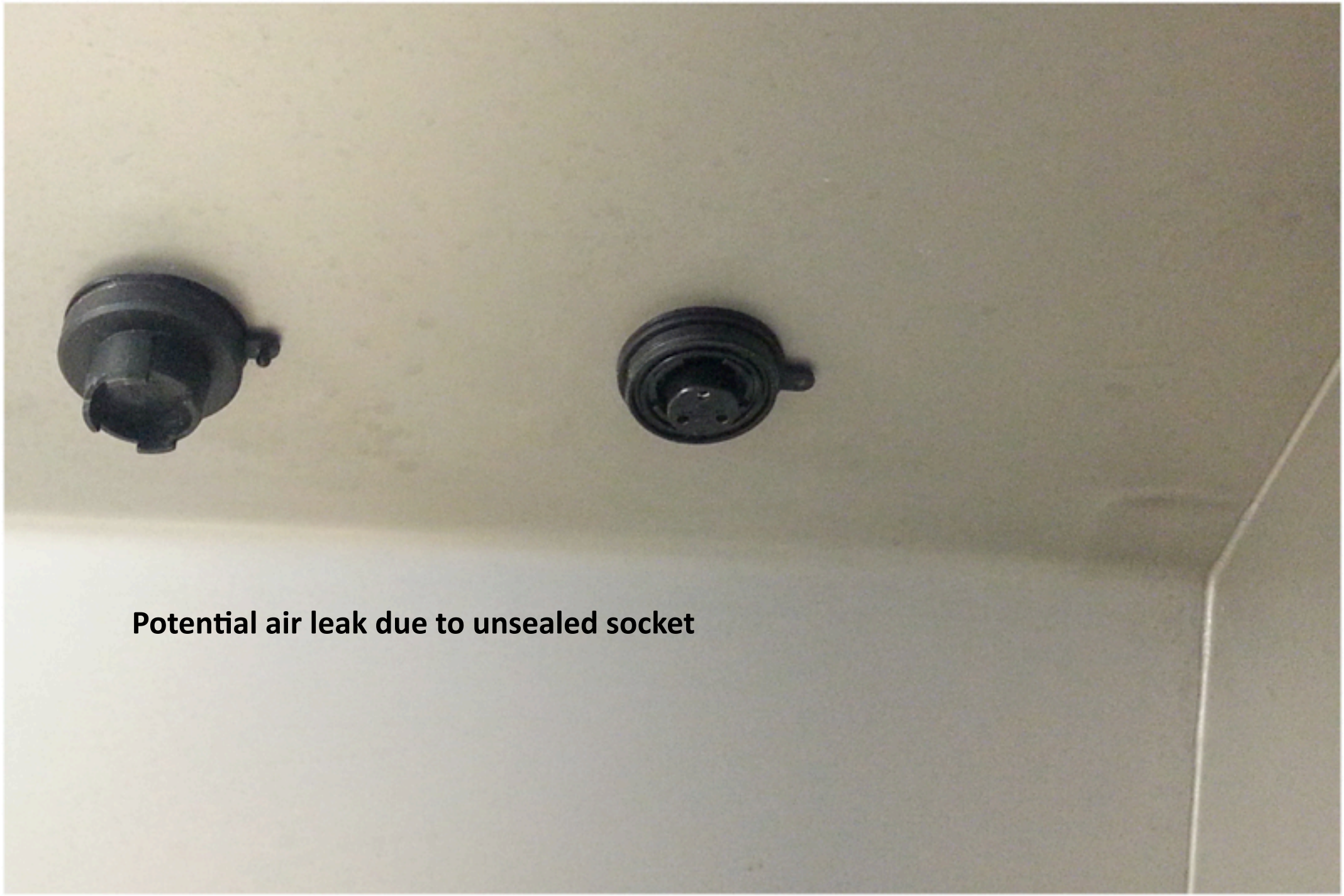
Ergonomic

- Outputs *(numbers and speed)*
  - Operator comfort –(*Throughput in commercial setting may lead to Upper Limb Disorders)*
- Degree of complexity
- Length of procedure


itg
Waste
Product


Access if something
goes wrong?


Siting of power sockets



Potential air leak due to unsealed socket


Don’t lose them!

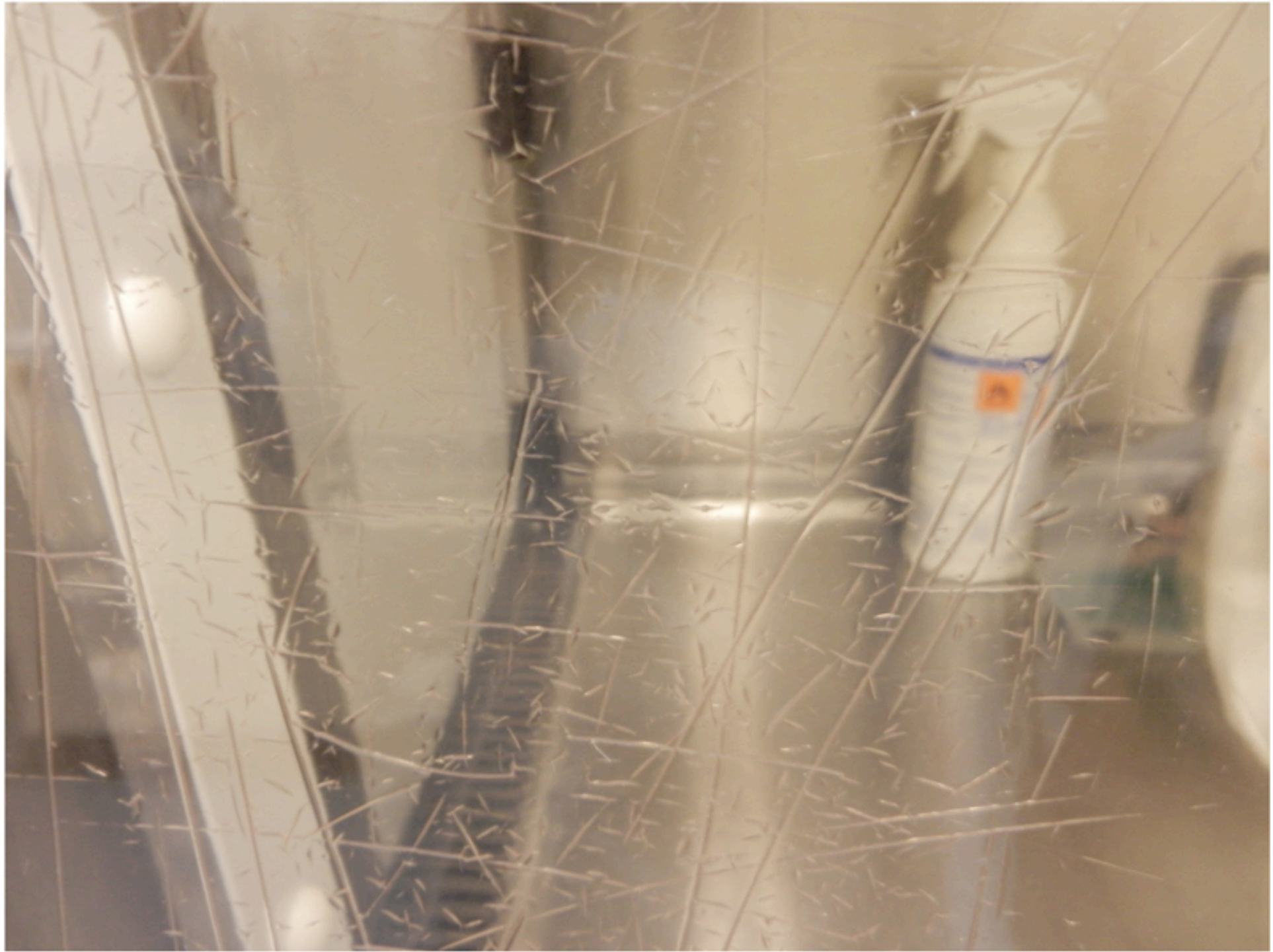
Factors affecting choice of technology

1. Health and Safety
   - Radiological
   - Biological
   - Ergonomic

2. Economics

Economics

1. Initial cost of workstation
2. Ease of installation
3. Commissioning costs
4. Power consumption
5. Annual maintenance costs and spares
6. Background environment costs - AHU/grade of room/ clothing
7. Estimated (working) lifespan
8. Replacement - decommissioning and removal costs



Conclusion

- The choice of barrier technology is entirely dependent on the circumstances for which it is being used
- No single type of workstation is suitable for a range of functions
- All have both advantages and disadvantages
- For a larger radiopharmacy it would be pragmatic to purchase a range of products thus increasing multi-tasking ability and future proofing

Acknowledgements

- Amercare Ltd
- Envair Ltd
- Cirrus Containments
- Walker Safety Cabinets Ltd
- Manchester Royal Infirmary Radiopharmacy Dept
- Preston Pharmaceuticals
- Royal Liverpool Radiopharmacy