BIOSAFETY in the AUTOPSY ROOM.
OUR EXPERIENCE.

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3 BASIC PRINCIPLES in Autopsy Biosafety
1. Personal Protective Equipment (PPE)
   - Gowns, surgical suits & caps, plastic disposable apron with full waterproof sleeves,
   - N95 Particle masks ➔ aerosol pathogens (3M 4255 FFA2P3 RD)
   - Goggles / face shield ➔ drops/particles
   - Shoe covers / Footwear restricted to contaminated areas
   - Cut & puncture resistant gloves, “triple sets” (made of plastic/kevlar or steel)

2. Clothing treated as contaminated (routine disinfection)
   - Wet clothing, towels or reusable clothing in hermetic biohazard bags

3. 2º Clean Assistant (records weights, observations, circulate supplies)

4. Consecutive autopsies. The greatest infective risk first
3 Basic Principles in Autopsy Biosafety...

- Sharp instruments must be taken care of
  - Injuries during routine autopsy procedures are entirely preventable
    - + frequent.: self-inflicted cuts (thumb, forefinger & middle fingers), dissection or trimming of tissues
  - NEVER: at the autopsy table. YES: in hands / instrumentation tray (above body legs)
  - Blunt-tipped scissors adequately substitute for a scalpel
  - Tissue support in dissection must be held with forceps or similar tool, never with the fingers
  - Protective surgical towels should be placed over the cut edges of the ribs
  - Needles / Sharp objects
    - Never be reused after first use. Removal of needles / Sharp objects should be disposed of into the approved receptacle.
  - Stabilizer sponge in opposite hand when making slices of large organ with long tool
  - Body wall suture ➔ hold the skin flaps with toothed forceps/clamps, never with the other hand.

- Equipment decontamination must be carried out
  - Appropriate Germicidal solution for known or suspected agents
  - Routine / infective cases: immersion in root cleaner / detergent sol, rinsing, and soaking in glutaraldehyde or solution 1:10 bleach 10 min.
3 Basic Principles in Autopsy Biosafety...


  “ENTIRE AUTOPSY AREA & CONTENTS= BIOHAZARD AREA (WARNING ON DOOR AND WALLS!)”

- Well ventilated
  - Negative room pressure airflow exhaust system, which releases the air directly to the outside, & remove aerosols.
  - Reduction of risk of splashing, spilling, drops or aerosols.

- Equipment, instruments and containers confined to designated areas
  - Stainless steel furniture and accessories

- Waste-water disposal must be implemented by
  - Use of Chemical cleaners & heated pipes

- Paperwork documentation
  - Could leave the room if it is not be contaminated
  - If it is been contaminated It cannot leave the room, the information should be transferred out by photo.

- Surface decontamination
  - Working surfaces Rinse with hot water, followed by 1:10 bleach solution. Avoid splashings.
  - Floor detergent solution, decontaminated and rinsed with water.
  - Ultraviolet light source (decontaminating surfaces and air)
3 Basic Principles in Autopsy Biosafety...

- Waste Management

**CATALOGACION DE RESIDUOS DEL SAS**

<table>
<thead>
<tr>
<th>NO PELIGROSOS</th>
<th>Residuos Generales Asimilables a Urbanos (RGAU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>III.a</td>
<td>- Residuos Sanitarios Infecciosos.</td>
</tr>
<tr>
<td></td>
<td>- Cultivos y reservas de agentes infecciosos.</td>
</tr>
<tr>
<td></td>
<td>- Sangre, hemoderivados u otros líquidos biológicos (&gt;100 mL).</td>
</tr>
<tr>
<td></td>
<td>- Restos anatómicos no identificables (no regulados por D. Policía Sanitaria Mortuoria).</td>
</tr>
<tr>
<td></td>
<td>- Aguas y otro material cortante y/o punzante (en contenedor de punzantes amarillo y luego dentro del verde).</td>
</tr>
<tr>
<td></td>
<td>- Vacunas vivas y atenuadas.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PELIGROSOS</th>
<th>Residuos considerados Material Específico de Riesgo Sanitario (MER).</th>
</tr>
</thead>
<tbody>
<tr>
<td>III.a</td>
<td></td>
</tr>
</tbody>
</table>

**A. SANITARIOS (RBSE’S)**

- Contenedor VERDE (destruible) 60 l. + Bolsa roja
- Contenedor VERDE (reutilizable) 60 l.

- Material y embalaje contaminado
- Material y embalaje con agentes infecciosos
- Material y embalaje con material cortante y/o punzante
- Material y embalaje con sangre
- Material y embalaje con cultivos y reservas de agentes infecciosos
- Material y embalaje con otros líquidos biológicos
- Material y embalaje con restos anatómicos no identificables
- Material y embalaje con vacunas vivas y atenuadas
- Material y embalaje con otros residuos no identificados

Precautions in *Infectious Autopsies*

- **General Practices**

  - *Infective aerosol transmission reduction practices*

  - **Practices in TBC, HIV, HB/HC**

  - **Practices in CJD**

  - **Protocol after exposure**
**BLS-2**

- Limited access
- DO NOT eat / drink / smoke
- Always use PPE
- ALL contaminated
- DO NOT touch without gloves
- Transporting tissues only within formol
- Washing hands BEFORE...

### Biosafety Level

<table>
<thead>
<tr>
<th>Biosafety Level</th>
<th>BSL-1</th>
<th>BSL-2</th>
<th>BSL-3</th>
<th>BSL-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>No Containment</td>
<td>Containment</td>
<td>High Containment</td>
<td>Max Containment</td>
</tr>
<tr>
<td></td>
<td>Defined organisms</td>
<td>Moderate Risk</td>
<td>Aerosol Transmission</td>
<td>“Exotic,” High-Risk Agents</td>
</tr>
<tr>
<td></td>
<td>Unlikely to cause disease</td>
<td>Disease of varying severity</td>
<td>Serious/Potentially lethal disease</td>
<td>Life-threatening disease</td>
</tr>
<tr>
<td><strong>Sample Organisms</strong></td>
<td>E.Coli</td>
<td>Influenza, HIV, Lyme Disease</td>
<td>Tuberculosis</td>
<td>Ebola Virus</td>
</tr>
<tr>
<td><strong>Pathogens</strong></td>
<td>Rabies &amp; Hemorrhagic viruses (ébola, arbovirus, et al.) ➔ BSL-4</td>
<td>Potentially aerosolized pathogens ➔ BSL-2 barrier + N95 masks + BSL-3 practices &amp; procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Protection of existing wounds and mucous membranes</td>
<td>Appropriate barriers</td>
<td>Contamination of worker’s skin &amp; clothing with barriers and hand washing</td>
<td></td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td>Control of work surface contamination</td>
<td>Washing hands</td>
<td>Safe disposal of contaminated waste</td>
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</table>
General practices...

- **Tissue Fixation** ➔ **10% Formol/formalin** (3.7% formaldehyde), **tissue vol. 10x**
  - Kill/inactive important infective agents, **EXCEPT prions & mycobacteria**
  - **Mycobacteria**
    - Viable in tissues for days, difficult to kill with standard formalin fixatives/ glutaraldehyde embalming fluids
    - Killed in fixative of 10% formalin + ethyl alcohol 50%

- **Photography of fresh tissues** requires the same precautions as the autopsy.
  - Handling ➔ clean gloves / clean helper person / hands – free camera system
  - In-situ photography best. Avoid additional risk of moving fresh tissue.
  - Suspected infective agent ➔ preferable fixed specimen photography.
  - Specimen transport, fresh / fixed, in clean pan
  - Cleaning of photo station/ camera / lenses with appropriate disinfectant or germicides

- **Freezing section** (benefits > potential risks)
  - It does not inactivate infectious agents. Estandard PPE. **OCT & isopentanu**. Cryostat cleaning (remove remains + ethanol 95%).
Infective aerosols reduction practices ...

- Limiting Aerosols of bone dust (skull / vertebral bodies)
  - Reduce with plastic cover and/or vacuum bone dust collector on the saw
  - High Efficiency Particle Air (HEPA) Filtering system
  - Moisten bone surfaces before sawing
  - Screw Cap containers preferable to other closing system
  - Open containers ➔ the opening should be covered with an aerosol container plastic bag

- Blood spraying
  - Must not overfill a blood vacuum tube by applying pressure through a syringe
  - Avoid using high – pressurised water

- Sterilisation of tissues before obtaining a sampling for cultivation
  - Hot metal instrument ➔ searing tissue, with splatters or plumes of smoke
  - Alternative: sterilize organ surface with iodized solution

Practices in TBC, HIV, HB/HC...

- **TUBERCULOSIS**
  - **Very brief exposure in necropsy ➔ very high risk of contamination**
    - Isolation of bacilli in: plates, 10 cm. Above cut fresh lung / furniture near room 24h post - autopsy
  - Preponderance of nosocomial infection in postmortem workers
    - TBC incidence in postmortem pathologists (10%) / pneumologists (4%)
  - Pulmonary TBC is responsible for 90% cases of occupational infection
  - Inhalation of aerosols or dry material

- **HUMAN IMMUNODEFICIENCY VIRUS**
  - Infrequent exposure. No evidence of easy acquisition. Autopsy performance is discouraged for immunocompromised workers.
  - Most common source: needles > deep scalpel cutting
  - Isolated in: skull / brain / spinal cord fluid / spleen / blood, 6 C⁰, 5 days post-mortem / room temp. 14 days
  - Inactivated by drying and disinfectants
  - Risk of seroconversion depends on: viral load / inoculated volume / susceptibility of the worker

- **HEPATITIS (HB/HC)**
  - **Very frequent exposure** to very small blood volume
  - **Worker´re carried out a vaccination, that´s compulsory!** (no post-mortem praxis without vaccination)
Practices in CJD / related prion disorders (Human Transmissible Spongiform Encephalopathies)...

Network Center BSL-3
Reference Center BSL-3
BSL-2
NETWORK Coordination System

Enfermedad de Creutzfeldt Jacob y otras Encefalopatías Espongiformes Transmisibles Humanas. Guía de información y recomendaciones para personal sanitario. 2002
Protocol after exposure...

• What to do?...
  o DO NOT PANIC!
  o Stop the activity
  o Object identification & safe storage
  o Wash (skin) / rinse (mucous membranes) with water & soap 15 min.
  o Communication to Preventive Medicine Department

Formaldehyde fixators are commonly used in the healthcare sector throughout the Union due to their easy handling, high degree of accuracy and extreme adaptability. It is foreseeable that, in some Member States, it will be difficult for the healthcare sector to meet the limit value of 0.37 mg/m³ or 0.3 ppm in the short term. Therefore, a transitional period of five years should be established for that sector during which the limit value of 0.62 mg/m³ or 0.5 ppm applies. However, the healthcare sector should minimise exposure to formaldehyde, and is encouraged to respect, where possible, the limit value of 0.37 mg/m³ or 0.3 ppm during the transitional period.
Exposure to other risks...

- Patients who died after receiving radioactive substances (radioisotopes). Residual radiation levels have not decreased before death.
- Scanning the body with a radiation detector before transfer to the autopsy room. In case of remains of an amount of > 5mCi, alert the pathologist and radiation safety specialist.

- Radioactive sources: tissue or body fluids after isotope / implanted ("seeds")

- Removing seeds:
  - The should be collected safely & properly disposed of.
  - The integrity of the seed must never be violated by cutting.
  - Contamination or aerosolised radiation:
    - Hold your breath, leaving everything on stage and leaving the room, restricting movements until studied.

Exposure to other risk...

- **Implantable Cardioverter – defibrillator (ICD)**
- Information on outside of metal case (manufacturer/model info. etched into the surface)
- **Discharge risk (25 - 40 J)** if detection lead is broken/cut
- **Must be deactivated before device manipulation**
  - Handling with **double layered latex surgical gloves**
  - According to the **manufacturer’s instructions**
  - Medical history review. / presence of **cardiologist personnel** (interrogate ICD)
- **DO NOT incinerate or discard**
Our autopsy room...
Our autopsy room...
Nuestra sala…
**Protocolo de SEGURIDAD ante Exposición a Radiaciones Ionizantes**

1. Si el cuerpo contiene >8mCi, alertar a SEGURIDAD RADIOLÓGICA

2. Bolsa específica para cadáver radiactivo

3. No violar la integridad de SEMILLAS mediante corte.

4. Terapia con 131I: Sangre / Orina / Tiroides = RADIATIVOS

5. Equipo de Protección Radiológica completo. Uso de pantallas/Escudos.

6. Nunca individual estancia, con señalización específica.

7. TODO RESIDUO ES RADIACTORIO. Control de contaminación en trabajadores y superficies.
   - Instrumentos y material debe ser verificado para radioactividad, almacenados, protegidos o descontaminados antes de devolver a su uso general.

8. Limpieza y desinfección planificada.

**Protocolo de SEGURIDAD ante Exposición a Radiación Eléctrica**

Desfibrilador Automático Implantable (DAI)

1. Obtener antecedentes médicos.

2. Uso de precauciones universales (Guantes) u otros dispositivos aislantes.

3. Localizar e identificar todos los dispositivos eléctricos implantados, NO CORTAR cables.

4. Si presencia de DAI, NO PROCEDER hasta que se desactive.

5. Contactar con Servicio de Cardiología o Fabricante.

6. Seguir las instrucciones del Fabricante para la desactivación.

7. Solicitar la información electrofisiológica de la memoria interna del DAI.

8. No DESECHAR ni INCINERAR.

**Protocolo de SEGURIDAD ante Exposición a Agentes Biológicos.**

1. Detener la actividad laboral.

2. IDENTIFICACIÓN del objeto y ALMACENAMIENTO seguro.

3. LAVAR (piel) / ENJUAGAR (mucosa) con agua y jabón 15 min.

   - VACUNACIÓN OBLIGATORIA VHB para todo trabajador con actividad post-mortem
   - PRUEBAS ANUALES DE TBC para todo trabajador con actividad post-mortem
   - MANTENER INMUNIDAD según PLANIFICACIÓN DE 5º DE PREVENTIVA
Our autopsy room...
Nuestra sala…
Our autopsy room...
Nuestra sala…
“The chapter of knowledge is very short, but the chapter of accidents is a very long one”
Lord Chesterfield, 1694–1773

The most dangerous in mortuary is the individual who ignores the potential hazards at necropsy.
Burton JL. 2003

Thank you very much for your attention