



STANDARD OPERATING PROCEDURE

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| SOP NUMBER ANA-002-02 | SOP TITLE DISSECTION HALL – THE EMBALMING SOLUTION |
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PART 1

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PART 2

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| Approver <hr/> Prof. Jean Calleja Agius Head of Department – Faculty of Medicine & Surgery | Approver <hr/> Mr Pierre Micallef Lab Manager – Life Sciences, Research Support Services Directorate |
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PART 3

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| Authoriser <hr/> Mr Simon Sammut University Secretary – Office of the Secretary Rectorate | Date of Issue: Date of next revision: |
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PART 4 (To be filled in by OOS, QSU or RSSD)

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| <input type="checkbox"/> This procedure has been revised and is no longer valid as from: (Write date) | <input type="checkbox"/> Date of NEXT REVISION is extended until: (Max. 4 years) | <input type="checkbox"/> SOP rendered obsolete on: (Write date) |
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1. Reason for revision

1.1. This SOP supersedes SOP ANA-TC-002-01. There are no technical changes and the only amendment made to the previous version is in the formatting and alignment to the current template of SOPs.

2. Purpose and scope

- 2.1. The purpose of this SOP is to define the process and laboratory protocols for the preparation of solutions used in embalming and storage of cadaver bodies at the Department of Anatomy.
- 2.2. This SOP will also identify and assign the responsibilities to persons working at the Anatomy department during the process of embalming.
- 2.3. This SOP should be used by experienced members of staff and students should follow the instructions under close supervision.

3. Definitions

3.1. **SOP** – Standard Operating Procedure

4. Responsibilities

Main responsibilities lie within the duties of the Lab Manager include:

- Preparation or oversight (if delegated), in the preparation of all solutions used in this procedure.
- Management of the entire embalming process.
- Ensuring all personal protection is available and safety equipment is in good working order at all times.
- Maintenance of the accident log-book.
- Co-ordination and management of waste generated and decontamination procedure in the event of spillage.

5. Health and Safety Requirements

- 5.1. Staff working in the dissection and embalming section should have the necessary vaccinations prior to handling of biological waste.
- 5.2. Gloves, goggles, lab coats should be worn at all times when handling cadavers.
- 5.3. The trolleys should remain within the dissection hall at all times.
- 5.4. When transferring cadavers or cadaver parts from one trolley to another it must be ensured that the brakes are locked.
- 5.5. Location of safety equipment as per below table:

| ITEM | LOCATION |
|-------------------------|---------------------|
| Eyewash / safety shower | Dissection hall |
| First aid kit | Dissection hall |
| Chemical spill kit | Dissection hall |
| Fire extinguisher | Dissection corridor |

Telephone

23403825

6. Procedure

The procedure for the preparation of the necessary solutions, embalming process, waste disposal and spill /decontamination protocols are described in the following sections:

6.1. Principle of Procedure

Walter Thiel developed the method that enables preservation of the body with natural colours in 1992. It consists in the application of an intravascular injection formula, and maintaining the corps submerged for a determinate period of time in the immersion solution in a stainless steel tank. The Thiel method is basically comprised of two types of solutions: intravascular injection and immersion to preserve bodies with characteristics that approximate the fresh cadaver as much as possible. This method of handling the cadaver is more efficient and convenient, and lacks the toxic or irritating gases due to minimum formaldehyde concentrations used in the formula. The Thiel soft-fix embalming method for preserving cadavers with “natural colours” achieves well preserved organs and tissues, with natural colour, consistency, flexibility, plasticity and transparency based on three processes: fixation, disinfection (bactericide) and preservation with solutions that contain 4-chloro-3-methy which phenol acting as a fixative, boric acid which acts as disinfectant and ethylene glycol for the preservation of tissue plasticity, as the basic components). Sodium Sulphite and formalin are added just prior to perfusion. The final formaldehyde concentration is less than 0.8 %. Formaldehyde contributes antiseptic properties (Hammer et al., 2015). The salts used (Ammonium Nitrate, Potassium Nitrate, Sodium Sulphite) absorb the water in the tissues, the nitrates they contain give the muscles a more reddish colour through the action of the. Thiel (1992, 2002) described a special solution for brain fixation: tap water 40 mL, Mono-ethylene glycol 10 mL, Isopropyl alcohol 40 mL and Formalin 10 mL. The application of this solution is done with a lumbar puncture needle trough the *lamina cribosa* of the ethmoid bone, to get to the subarachnoid space in direction to the Bregma, to the anterior horn of the lateral ventricle and finally to the corpus callosum cistern. With this procedure, the solution will reach brain and spinal cord. Thiel described that a peristaltic pump may be used for this perfusion that allows a constant flow of the fixation solution (0,17 - 19 mL/min). The softness of the brain conservation was fixed by the addition of high concentrations of Formalin.

6.2. Embalming process

6.2.1. Preparation of embalming solution

For cadaver embalming, 15.8 Liters of embalming solution is prepared in the following proportions:

- Solution A 14.3 Liters
- Solution B 0.5 Liters
- Formalin 300 mls
- Sodium Sulphite 700g
- Top up with water to 15.8 Liters

Solution A

- Boric acid 3%
- Mono-ethylene glycol 30%
- Ammonium nitrate 20%
- Potassium nitrate 5%
- Water

Solution B

- Mono-ethylene glycol 10%
- 4-chloro-3-methylphenol 1%

Following embalming, cadavers are immersed in the immersion tank with the Thiel embalming solution for 4-6 weeks.

6.3. Equipment used

- Embalming solution pump
- Embalming tank

6.4. Waste disposal

- 6.4.1. Chemical waste – Store in a dry, cool and well-ventilated place. Keep container closed when not in use.
- 6.4.2. Biological waste – following research and studies, cadavers are buried at the Addolorata cemetery.

6.5. Spill and accident procedures/decontamination

- 6.5.1. Any spillages should be contained. Bleach should be added to body fluid and blood spillages. The bleach should be kept for 5 minutes. The area should be wiped clean after and wipes discarded in the biohazard bags.
- 6.5.2. All accidents are to be recorded in the **accident book** with the following details: Date, Name, Time of accident and Signature.
- 6.5.3. The accident log book will be used by staff, students and visitors to the Dissection Hall.

7. References

- 7.1. Hammer, N.; Löffler, S.; Bechmann, I.; Steinke, H.; Hädrich, C. & Feja, C. Comparison of modified Thiel embalming and ethanoglycerin fixation in an anatomy environment: Potentials and limitations of two complementary techniques. *Anat. Sci. Educ.*, 8(1):74-85, 2015.
- 7.2. Groscurth, P.; Egli, P.; Kapfhammer, J.; Rager, G.; Hornung, J. P. & Fasel, J. D. Gross anatomy in the surgical curriculum in Switzerland: improved cadaver preservation, anatomical models, and course development. *Anat. Rec.*, 265(6):254-6, 2001.
- 7.3. Kerckaert, I.; Van Hoof, T.; Pattyn, P. & D'Herde, K. Endogent: Centre for Anatomy and Invasive Techniques. *Int. J. Exp. Clin. Anat.*, 2:28-33, 2008.
- 7.4. Thiel, W. Die Konservierung ganzer Leichen in natürlichen Farben. *Ann. Anat.*, 174:185-95, 1992.
- 7.5. Thiel, W. Ergänzung für die Konservierung ganzer Leichen nach W. Thiel. *Ann. Anat.*, 184:267-9, 2002.

7.6. Wolff, K. D.; Kesting, M.; Mücke, T.; Rau, A. & Hölzle, F. Thiel embalming technique: a valuable method for microvascular exercise and teaching of flap raising. *Microsurgery*, 28(4):273- 8, 2008.

7.7. Thiel, 1992; Groscurth et al.; Thiel, 2002; Kerckaert et al.; Wolff et al., 2008

8. List of Appendices/Worksheets

8.1. N/A