1.0 PURPOSE:

Agar-based tissue-mimicking material (ATMM) has an acoustic attenuation and an acoustic velocity similar to that of real tissue. These properties make ATMM suitable for ultrasound experiments. At first, ATMM is mixed and produced in liquid state, and is later cast into a model of a certain geometry and is left to solidify.

2.0 SCOPE:

2.1 Procedure is to be performed in a containment level 1 (CL1) laboratory with an available fumehood.

2.2 This procedure specifies quantities required for producing **2L** of ATMM.

3.0 RESPONSIBILITIES:

3.1 Someone trained by a qualified individual should perform this procedure.

4.0 DEFINITIONS:

ATMM – Agar tissue-mimicking material

5.0 REFERENCES:

None.

6.0 MATERIALS AND EQUIPMENT:

6.1 MATERIALS:

- Agar
- Glycerol
- Sigmacell Cellulose (Type 50, 50µ average particle size)
- Water (distilled)

6.2 EQUIPMENT:

- Microwave
- Melting pot
- Tray

7.0 PROCEDURES:

Shortly after ATMM has been prepared and heated, it will begin to set as soon as its temperature drops under 40ºC.

7.0.1 MIX MATERIALS:

1. Pour 2L of distilled water into the melting pot.
2. Add 160mL of glycerol.

3. Using a digital scale, measure 70g of Agar. Add the Agar into the melting pot.
4. Mix the contents with a mixing rod.

7.0.2 HEAT MIXTURE:

1. Put the melting pot with the contents into the microwave and heat for 20min.
2. After heating, remove the air bubbles on the surface of the mixture with a spoon.
3. Heat contents in the microwave for an additional 10min. The mixture will become transparent if it has been sufficiently heated.
4. After heating, skim the surface of the mixture with a spoon again to remove air bubbles. Mix the contents slowly.

> △**CAUTION:** The melting pot and its contents are very hot. Be very cautious with handling.

5. Using a digital scale, measure 60g of Sigmacell.
6. Add the measured Sigmacell into the mixture. Mix well.

7.0.3 COOL MIXTURE AND ADD FORMALDEHYDE:

The mixing and measurements involving formaldehyde must take place inside a working fumehood. Refer to section 20: Appendix 10 of the Robarts Laboratory Health and Safety Manual for information about the use and maintenance of the fumehood.

1. Using a 60cc syringe, draw in 40mL of formaldehyde. (20mL per 1L of mixture)

> △**WARNING:** Use a NIOSH approved respirator when handling formaldehyde. It is toxic to the lungs.

2. Place a tray into the sink.
3. Place the melting pot with its contents into the tray.
4. Position a thermometer into the center of the pot to keep track of the temperature.
5. Begin gently pouring cold water into the tray.
6. Stir the mixture with a stir rod while monitoring the temperature.
7. Once the temperature is 44-45ºC, add the formaldehyde from the syringe.

> △**CAUTION:** Use a NIOSH approved respirator when handling formaldehyde. It is toxic to the lungs.

8. Mix the contents well, and skim the bubbles from the surface if there are any.

7.2 SAMPLE STORAGE AND HOLDING TIMES:

How shall time limits be monitored and maintained? By whom? How is the product going to be store? Holding Time: The maximum amount of time a sample may be stored before analysis

7.3 RISKS TO PERSONNEL AND PRECAUTIONS FOR RISK REDUCTION:

7.3.1 Wear lab coat, gloves, a respirator, and googles throughout the experiment.

7.3.2 Commonly encountered difficulties or errors, situations that can increase the danger to personnel.

7.7 CONTINGENCIES:

7.7.1 TEMPERATURE DROPS TOO LOW:

If the temperature drops too low (below 40ºC), the mixture begins to set and you cannot continue with the experiment. You must repeat the experiment from the beginning.

7.7.2 ATMM SPILL:

If the mixture spills, wait for it to cool and then clean it. Dispose of the waste as normal garbage.

8.0 REPORTING AND DOCUMENTATION:

N/A

9.0 REVIEWS AND REVISIONS:

This procedure shall be reviewed for compliance and effectiveness and revised as necessary.

10.0 ATTACHMENTS and REFERENCE FORMS:

None.