

Prolonging the Shelf Life of Homemade Ultrasound Phantoms

Anthony Re, MD; Claire Harryman, MD; and Kimberly M. Rathbun, MD, PhD, MPH

BRODY SCHOOL OF MEDICINE

7th Annual Medical Education Day

rea19@ecu.edu

No disclosures

- Phantom models are used in medical education for teaching ultrasound and practicing invasive ultrasound-guided procedures
- Commercial phantoms are expensive, so many “homemade” phantoms have been created
- A major drawback to homemade phantoms is longevity
- What combination of *inexpensive* preservatives will be most effective in extending shelf-life of Phantom models without compromising imaging?

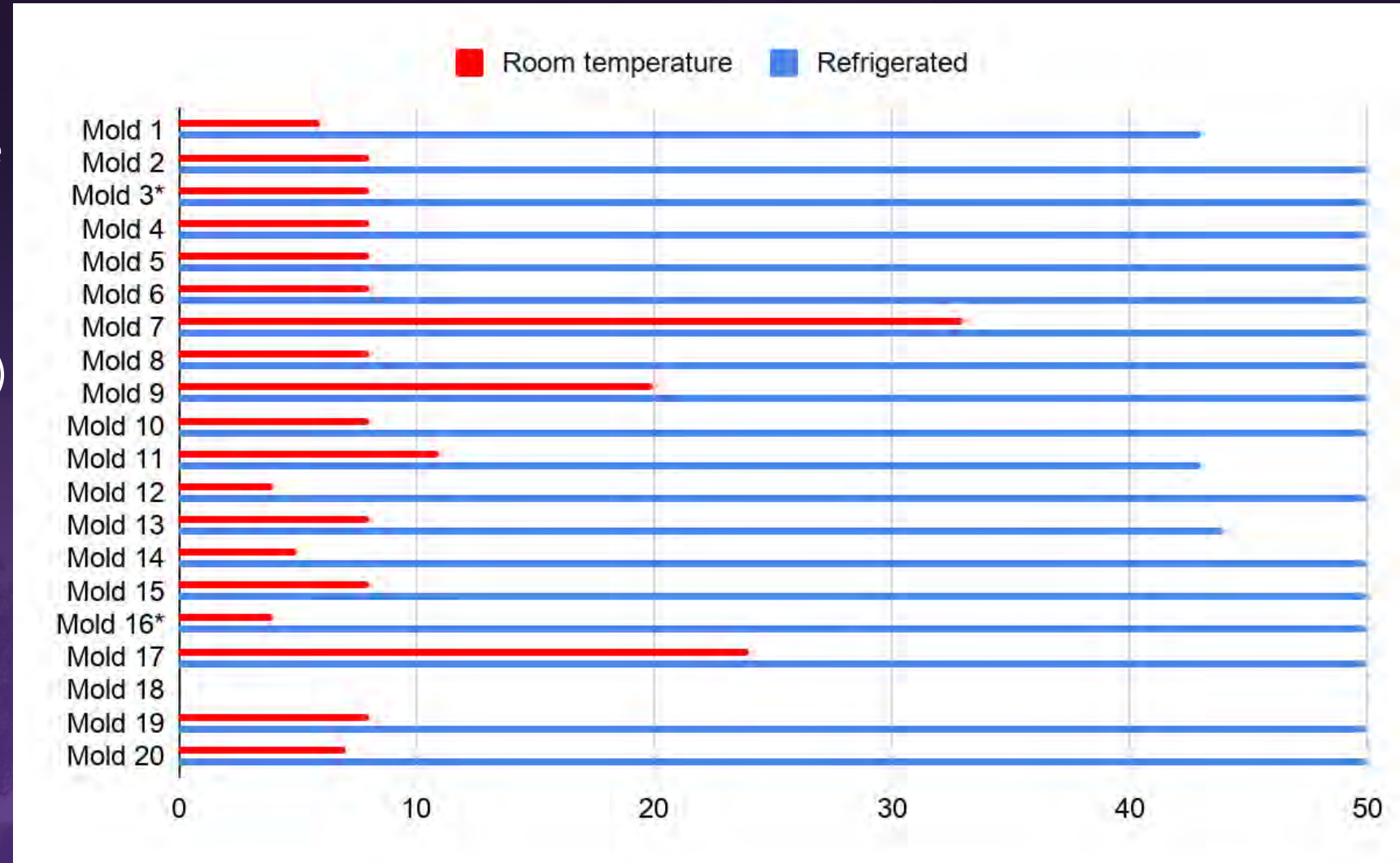
- Our observational study composed of 2 sets of 20 phantom molds: 1 set refrigerated and 1 set kept at room temperature
- 18 sets had preservatives, 2 sets were controls
- Phantoms were evaluated daily for bacterial/fungal growth, degradation, etc.

Table 1: Additives to the gelatin base

Sample Number	Additive	Amount of Additive	Brand Information
1	Control		
2	Ascorbic acid	1/4 tsp in 100mL	The Barry Farm, Wapakoneta, OH
3	Benzoic acid	1/4 tsp in 100mL	Glycerin Suppliers, Houston, TX
4	Citric acid	1/4 tsp in 100mL	Milliard Brands, Lakewood, NJ
5	Potassium sorbate	1/4 tsp in 100mL	North Mountain Supply, Muncy Valley, PA
6	10% povidine-iodine	5mL in 100mL	CareFusion, Vernon Hills, IL
7	4% chlorhexidine gluconate	5mL in 100mL	SC Johnson Professional, Charlotte, NC
8	0.13% benzalkonium chloride	5mL in 100mL	Johnson & Johnson, Skillman, NJ
9	Bleach	5mL in 100mL	Walmart, Bentonville, AR
10	Distilled white vinegar 5% acidity	5mL in 100mL	Walmart, Bentonville, AR
11	Table salt	1/4 tsp in 100mL	ALDI Inc, Batavia, IL
12	Ball fruit-fresh	1/4 tsp in 100mL	Rubbermaid Inc, Atlanta, GA
13	70% isopropyl alcohol	5mL in 100mL	Vi-Jon, Smyrna, TN
14	50% isopropyl alcohol	5mL in 100mL	H.E.B, San Antonio, TX
15	10% acetone	5mL in 100mL	Walmart, Bentonville, AR
16	Magnesium sulfate (e.g. epsom salt)	1/4 tsp in 100mL	Target Corporation, Minneapolis, MN
17	10% povidine-iodine	layer on top	CareFusion, Vernon Hills, IL
18	4% chlorhexidine gluconate	layer on top	SC Johnson Professional, Charlotte, NC
19	0.13% benzalkonium chloride	layer on top	Johnson & Johnson, Skillman, NJ
20	Control		

- Refrigeration was by far the most effective method of preservation

- Household bleach (9), 10% povidine-iodine topped (17), and 4% chlorhexidine gluconate mixed (7) were the most effective at room temperature
- 4% chlorhexidine gluconate (18) topped was unusable from the start (liquified)
- * Benzoic acid (3) and magnesium sulfate (16) would compromise imaging



- Regardless of preservative selected, refrigeration will preserve phantoms the longest
- Not all phantoms are able to be covered/refrigerated - either bleach, povidine-iodine topped, and 4% chlorhexidine gluconate mixed are good choices to preserve at room temperature
- Aridity could play a role in refrigerated samples not covered
- When will refrigerated samples be dried out to the point that the Phantom is an inferior scanning model?