

## CONTINUED PRESERVATION OF SALT-EMBALMED CATS

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## ABSTRACT

Eighteen cats were fixated in 5% formalin and embalmed in dry salt (NaCl). In this preparation majority of the cats showed a slightly-dark appearance, a coarse muscle texture with distinct and clear outlines and fibers. Also in this preparation 33.33% of the cat specimens resisted molds infestation for one month; 55.55% for a two-month period; and 11.11% for three months. Likewise, 94.44% withstood worm attack for three months.

Decomposition and dryness had occurred among a majority of the cat specimens, but on a very minimal scale. Proper care and maintenance of the specimens prevented them from deteriorating and drying.

## Introduction

In 1974<sup>1</sup> the author conducted a study on embalming cats using a salt-formalin solution. This was followed by another study in 1982<sup>2</sup> where the same preservative was used in preserving cats but this time employing improved techniques, including the application of additives.

In view of the excessive increase in the price of formalin due to scarcity of supply at the time, the author had worked on another study. But this time, instead of using the salt-formalin solution dry salt was used.

Before this study, a preliminary work was undertaken by Miss Rizalina Gonzales and the author using eight cats. During the latter part of 1985, the author conducted a follow-up study. Eighteen cats were used and the Zoology 102 anatomy students were enlisted in the dissection and maintenance of the cat specimens.

The study on the preservation of cat specimens kept in salt solution was to determine the resistance and effectiveness of dry table salt as a preservative in inhibiting the growth of molds, preclude attack by worms, delay putrefaction and desiccation, and to lighten the cumbersome method of embalming cats and maintaining their preserved state.

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\*Miss Rizalina Gonzales was the thesis advisee of the author.

## MATERIALS AND PROCEDURE

1. The study used 18 cats of average size.
2. The cats were killed by anesthetizing them with chloroform, and then prefixed by injecting 1 liter of 5 percent formalin through the femoral vein or sciatic artery by gravitational flow.
3. The skinned cats were then buried in dry table salt for 14 days.
4. The cats were dissected and studied by the Zoology 102 anatomy students of the author for the second semester of Academic Year 1985-1986.
5. The cat specimens slightly infested by molds and worms were treated by rubbing dry salt on the affected areas or parts of the body. When they were repeatedly or heavily attacked, they were then re-buried in salt.
6. Observation on the growth of molds or attack by worms, putrefaction and dessication was done every other day.

## RESULTS AND DISCUSSION

### Body Characteristics

The cats embalmed in dry salt have shown the following properties: a) the body form was normal and oily; b) the muscle outlines and fibers were visibly distinct and clear; and c) the cats smelled of mild formalin.

The cat specimens that were newly removed from the salt containers showed a slightly dark appearance; however, a few days' exposure to room light caused them to turn whitish, as shown in Figure 2. Once the cats had this color, the muscles became more distinct and clear. Likewise, the mild formalin odor which was noticeable at first, disappeared completely after a lapse of a few days. This change was due perhaps to exposure of the specimens to air.

It was also noted that all the cat specimens had remained soft and pliable throughout the duration of the study. Even the viscera of aged specimens still smelled good, and the organs such as the liver, lungs, heart, intestines, pancreas, and the stomach were visibly fresh-looking, although slightly hard, with no sign of deterioration or shrinkage.

These properties can be attributed to 1) the preservative salt, 2) techniques of embalming and 3) the maintenance of the specimens. The veins of most of the specimens likewise were dark, intact, and easily traceable.

### *Non-attack from Molds and Worms*

Table 1 shows the number of treatments (T) that the cats were subjected to and Table 2 shows the longevity range and the percentage of cats that remained unaffected by any unfavorable change in every treatment. To show the degree of longevity range, this was further categorized into a) lower range, b) middle range, and





Figure 1. Cat specimens in cloth bags.



Figure 3. Anatomy students studying their cat specimens preserved in dry table salt.





Figure 2. Seventeen-day old cat specimens.

c) higher range. The lower range indicates the number of days the cats lasted before being attacked by molds and worms within a month; the middle range within a two-month period; and the higher range within a span of three months.

In the initial preparation ( $T_1$ ), there were six cats in the 20-30 days range; ten cats in the 32-47 range; and two cats in the 63-74 range. Percentage-wise, the unaffected specimens in the lower range constituted 33.33%; the middle range, 55.55%; and the higher range, 11.11%. The preceding data on ranges showed that the greater percentage (55.55) of cats preserved in salt in  $T_1$  lasted within a two-month period before there arose the need of subjecting them to additional treatments. This percentage, however, is lower than those of the cats preserved in the salt-formalin solution where 90% resisted attacks by molds and worms for three months.<sup>2</sup>

The results of  $T_2$  showed that there were fifteen cats that fell in the lower range, that is, from 3-29 days; and three cats in the middle range of 33-57 days. This number constituted 83.33% and 16.67%, respectively.  $T_3$  showed that there were thirteen cats that fell in the lower range (2-24 days) and two cats in the middle range of 34-58 days. These specimens constituted 72.22% and 11.11%, respectively. There were four cats that remained untreated and these constituted 16.67%. In  $T_4$  twelve cats fell in the 2-29 range and two cats on the 31-41 range. The former constituted 66.67%, and the latter constituted 11.11%. There were four cats that were not treated and were affected by either molds or worms, or by both; and this constituted 22.22%. In  $T_5$  to  $T_{10}$ , all the specimens fell in the lower range. The lower range in  $T_5$  was 61.11%;  $T_6$ , 5.0%;  $T_7$  38.89%;  $T_8$ , 22.22%;  $T_9$  to  $T_{10}$ , 0.55% each.

Table 1. Number of days cat specimens remained free from molds and worms per treatment.

Specimens	T R E A T M E N T S									
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>6</sub>	T <sub>7</sub>	T <sub>8</sub>	T <sub>9</sub>	T <sub>10</sub>
1	34	34								
2	40	11	23	17						
3	63	29								
4	30	10	4	41						
5	40	17	17	10						
6	32*	15	18	2						
7	36	38	11	6						
8	32	3	2	29	8	2	9	2	2	2
9	28	16	3	13	18	13				
10	28	6	2	25	7	6	11	2		
11	36	2	52							
12	44	3	34	2	5	2	1			
13	20	6	10	25	2	11	7	10		
14	28	6	3	31	10	3	6	6		
15	47	29	5	2	4	4				
16	74	17								
17	30	33	7	4	7	4	6			
18	45	5	24	7	6	2	2			

\*Cat specimens were attacked by worms.

**Table 2. Longevity Range in Days Per Treatment.**

Treatments	Lower Range	% Survivors	Middle Range	% Survivors	Higher Range	% Survivors
1	20-30	33.33	32-47	55.55	63-74	11.11
2	3-29	83.33	33-57	16.6		
3	2-24	72.22	34-52	11.11		
4	2-29	66.6	31-41	11.11		
5	2-18	61.11				
6	2-13	5.0				
7	2-11	38.88				
8	2-10	22.22				
9	2-0	0.55				
10	2-0	0.55				



The extrapolation of results and data in Table 1 and Table 2 indicated that a high percentage of cats in the course of the study received more than two treatments, and that additional treatments increased the number of cats that acquired immunity from molds infestation.

For instance, in T<sub>3</sub>, there were 15 cats that received additional treatments; in T<sub>4</sub>, fourteen cats; in T<sub>5</sub>, eleven cats; T<sub>6</sub>, nine cats; T<sub>7</sub>, seven cats; T<sub>8</sub>, four cats and finally T<sub>9</sub> and T<sub>10</sub>, one cat for each treatment.

Of the eighteen cats, only specimen 6 was attacked by worms; however, only the left ear was infested, and infestation occurred only on the 32nd day. Since this was heavy or acute the specimen was re-buried in dry salt for two days. As a result of this treatment the cat was no longer attacked by worms, although there was a recurrence of infestation by molds.

The molds infestation on the cat specimens was minimal and the presence of fungi or molds was concentrated in small, scattered, rounded colonies or spots. The head, limbs, and abdomen were the most frequently affected organs of the body.

Since the molds infestation was slight and usually localized, the affected areas were then treated by rubbing them with dry salt. Rubbing salt on the fungal spots stopped the possible recurrence of fungus. If ever there was a recurrence of fungal attack, it would occur on the other parts of the cat's body, but rarely on the same area.

All the eighteen cats were attacked or infested by molds during the study. Some were attacked in the early stage and others much later. With regard to attack by worms, 100% of the cats remained unaffected, except for specimen 6 which was attacked only on the 32nd day, and this did not recur.

#### Putrefaction and Desiccation.

Of the eighteen cats under study, only specimen 6 was attacked by worms as indicated in Table 1. The organ affected was the left ear. The presence of worms in the left ear was attributed to the decomposition of the tissues of the organ. Inasmuch as decomposition of the tissues was acute, the specimen was re-buried in dry salt. This treatment thus completely checked the possible recurrence of putrefaction and attack by worms.

Decomposition of tissues and organs were also observed to have occurred among a majority of the cats. But then, the degree of decomposition was rather slight and negligible. The organs observed to be frequently affected were the extremities of the limbs, and decomposition of these parts was due to the weak penetration of the fixing fluid.

From the start to the end of the study, the visceral organs had never suffered even minor putrefaction, but remained always fresh-looking, although slightly stiffened. This is attributed to the proper fixing of the organs and its favorable reaction to salt.

Majority of the specimens preserved in formalin<sup>1,2</sup> usually dried up so fast that in a matter of days the cats were discarded. Cats preserved in salt-formalin<sup>1,2</sup> remained soft and pliable, and this was because desiccation was very slow and gradual. There was not a single specimen that was discarded because of acute or severe dryness after these were treated with the latter solution.

The favorable reaction of the specimens to salt and the techniques used had contributed to the softness and pliability of the muscles. This muscle characteristic remained throughout, but slow dryness was noted to occur among the specimens, especially on the lower extremities of the limbs, thin muscles of the head, and those dissected and separated muscles. Nevertheless, dryness never became a serious or severe problem. Keeping the cats wrapped in moist cloths when not in use had kept their muscles clear and prevented them from further dryness.

### SUMMARY AND CONCLUSION

The cats preserved in dry table salt at first showed a slightly dark and later a whitish appearance. The change was attributed to the exposure of the cats to room light. Another characteristic was the muscle texture which showed clear and distinct linings and fibers, and which were, therefore, appropriate for dissection and study. The newly removed cats smelled of mild formalin. This was also the case with cats preserved in salt-formalin solution<sup>1,2</sup>. However, the mild odor of formalin disappeared completely as these were dissected from time to time.

The data in Table 1 indicate that the greater number of cats (55.55%) have been freed from molds attack within a two-month period. The cats that were given several treatments gradually acquired immunity against attack by molds, and 100% preservation was achieved.

As to worm infestation, 100% of the cat specimens have remained free from worm attacks during the study, except specimen 6 which was attacked after one month; however, the attack was checked and resistance was strengthened after the cat was re-buried in salt.

Decomposition and desiccation of tissues and organs of the cats were observed to occur among the majority of the specimens. However, the degree of decomposition was minimal, and considered negligible. The favorable reaction of the specimens to salt and the techniques used were contributory factors in making the muscles of these cats pliable.

In the course of the study, there was not a single cat specimen that was discarded due to serious or severe infestation by molds and worms, or by heavy decomposition or dryness.



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## LITERATURE CITED

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