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Postmortem Findings of the Victims of the Jonestown Tragedy

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ABSTRACT: The procedure for processing and identifying the victims of the Jonestown, Guyana tragedy is outlined. Autopsies were performed on seven of the victims, and the autopsy anatomic and toxicologic findings are presented. Problems encountered in the interpretation of the autopsy findings are noted.

KEYWORDS: pathology and biology, human identification, decomposition. Guyana, cyanide, Jonestown, formaldehyde

On Saturday, 18 Nov. 1978, over 900 people died in Jonestown, Guyana. The circumstances surrounding this incident were thoroughly reported by the news media [1,2]. On Thursday, 23 Nov., the first bodies arrived at Dover Air Force Base, Dover, Delaware. On Monday, 27 Nov., a team of pathologists, dentists, and technicians began examining the bodies in the mortuary on the base (Fig. 1). As the bodies arrived by U.S. Air Force planes from Guyana, they were stored in refrigerated trucks. Upon being transferred to the mortuary, the bodies were removed from the metal transfer cases, weighed, and put on gurneys. They were then examined by a team consisting of one pathologist and two graves registration technicians (Fig. 2). Two members of the team examined the body, personal effects, and clothing and the third recorded the results on a chart. The clothing was described, paying special attention to any identifying marks, and was then removed from the body. Many articles of clothing had names written on them as laundry marks, but it soon became apparent that there was much interchange of clothing, as some articles had more than one name on them. Any personal effects were described and placed in plastic bags. The bodies were examined for evidence of injuries, surgical scars, and any other identifying marks. The length of the body, the estimated age, and the race, color of hair, sex, and weight were recorded. A

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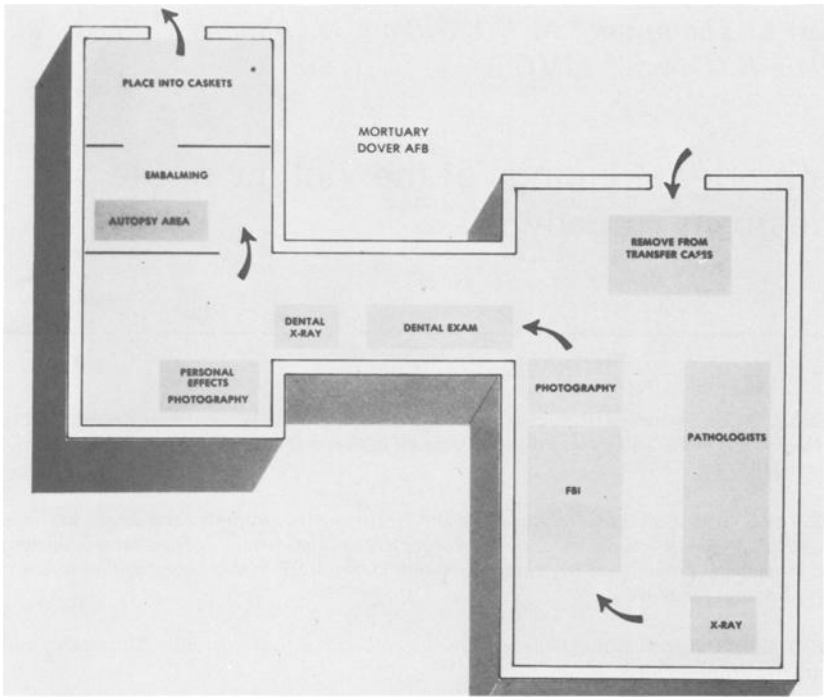


FIG. 1—Diagram of the order of processing bodies at the mortuary at Dover Air Force Base (AFIP Neg. 85-8921-2).



FIG. 2—Team examining a body (AFIP Neg. 85-8921-10).

large number of bodies were maggot-infested (Fig. 3), and some exhibited partial skeletonization because of severe postmortem decomposition (Fig. 4). Other bodies were better preserved, but all showed moderate-to-severe decomposition.

After this examination, the FBI disaster team took fingerprints (and footprints from infants). Even though the majority of the bodies were badly decomposed, adequate fingerprints were obtained from most bodies. Photographs of each body were then taken. The dentists examined each body, and dental X-rays were obtained. Photographs were taken of



FIG. 3—*Extreme postmortem decomposition (AFIP Neg. 85-8921-1).*



FIG. 4—*Partial skeletonization of a body (AFIP Neg. 85-8921-9).*

any personal effects that were thought to be useful for identification, and the bodies were then taken to be embalmed. Each body had been given a number by the recovery teams in Guyana, and the status of each body (identified by its number) was recorded on a large board. Total body X-rays were not taken of every body, but a portable X-ray machine was available for use in selected cases, for example, one body had a cast on its leg, so the leg was X-rayed. This phase of the identification process was completed on Saturday, 2 Dec.

At the early stages of the body examinations, State Department officials were told that autopsies should be performed on a statistically significant number of the bodies. It was the opinion of the attorneys at the State Department that there was no authority to perform autopsies; therefore, all the bodies were embalmed with no expectation of later performing autopsies. Some time later, after much discussion, it was decided to try to get permission from the families to perform autopsies on all the bodies with traumatic injuries and on a few with no such injuries. This permission was obtained, and on 15 Dec. 1978, seven autopsies were performed by four forensic pathologists from the Armed Forces Institute of Pathology and a civilian consultant.

Autopsy Findings

On examining the teeth of the victims, it was discovered that some of the teeth were pink. This phenomenon was originally thought to be caused by cyanide intoxication, but on later evaluation, it was determined to be caused by postmortem decomposition. Kirkham et al. [3] found that the breakdown of red blood cells in the pulp chamber of teeth diffused hemoglobin and serum proteins into the dentine, creating the pink color.

Because the bodies that were to be autopsied had been embalmed, they had to be washed extensively to remove the embalming powder that had been sprinkled on their surface (Fig. 5). Total body X-rays were taken of all seven bodies to be autopsied, but no radiologic findings were identified other than the findings noted on anatomic dissection. All of the bodies showed evidence of marked postmortem decomposition.

Of the seven bodies that were autopsied, only two had traumatic injuries sufficient enough to result in death. Body B013 had a hard contact gunshot wound (Fig. 6) of the left temple



FIG. 5—Embalming powder on body that is to be autopsied (AFIP Neg. 85-8921-7).

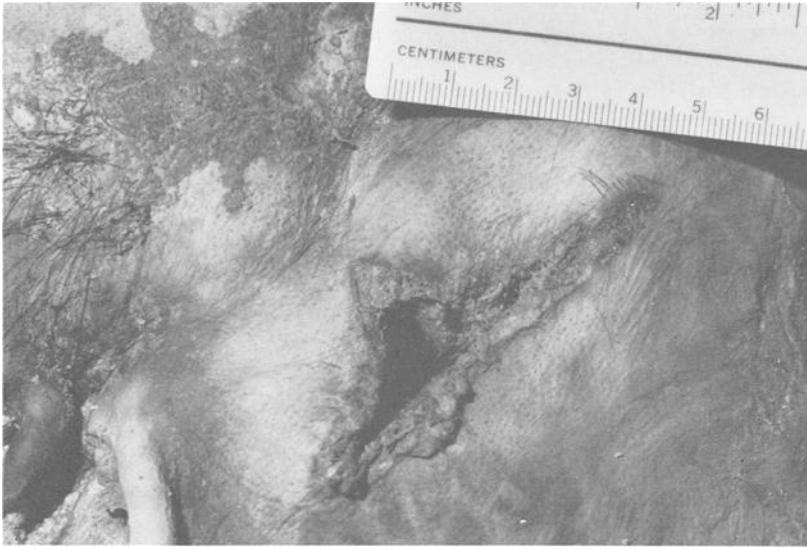


FIG. 6—Entrance wound on Body B013 (AFIP Neg. 85-8921-8).

area, with the exit (Fig. 7) at the right temple. The entrance wound exhibited the typical stellate tearing with internal beveling of the skull beneath this area, and there was external beveling of the skull on the exit side, showing without question that the bullet traveled from left to right. The brain was extremely soft, and no missile track was identified within the brain substance. No powder residue was identified in the area of the entrance wound—not on the skin surface, in the subcutaneous tissue, or on the external surface of the skull. Swabbing of the hands for powder residue was considered but was not done because the embalm-

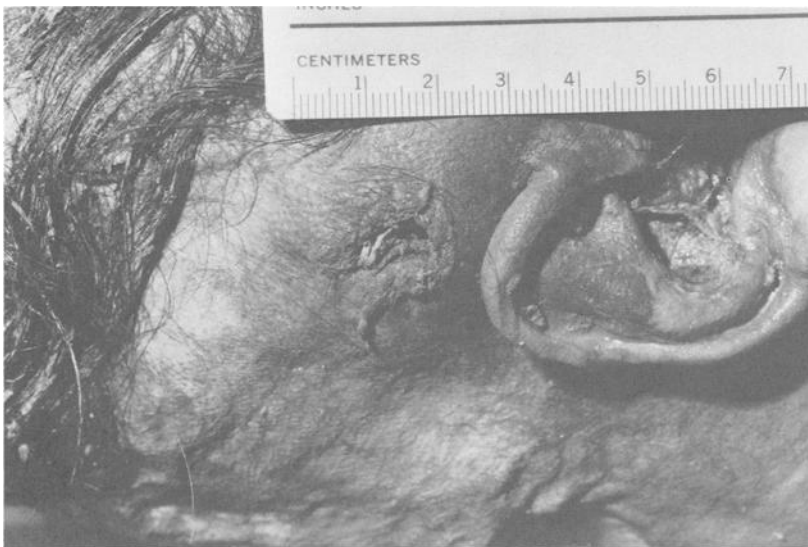


FIG. 7—Exit wound on Body B013 (AFIP Neg. 85-8921-6).

ing and other extensive handling of the body after death would have made the results difficult to interpret.

The second victim (A001) of a gunshot wound had a large deforming wound (Fig. 8) in the right temple area. The exit wound (Fig. 9) was in the left temple with separation of the wound edges. The wound edges in the entrance and exit areas were approximated with suture material to reconstruct better the wound (Fig. 10). Examination of the skull after removal of the scalp revealed large defects both in the entrance and exit areas. There was some bevelling at the edge of the left temple wound that identified it as the exit wound.

Examination of the other five bodies revealed no anatomic changes except for postmortem decomposition and evidence of embalming.

Toxicologic Studies

The drugs that were found in each of the bodies are listed in Table 1. The tissues examined were brain, liver, kidney, muscle, stomach, spleen, and lung. The brain tissue was particularly useful because it had not been extensively infiltrated with embalming fluid. Areas of muscle that had not been extensively infiltrated with embalming fluid were also saved. No blood or urine was available. The drugs were identified by ultraviolet spectrometry and gas



FIG. 8—Entrance wound on Body A001 (AFIP Neg. 85-8921-3).



FIG. 9—Exit wound on Body A001 (AFIP Neg. 85-8921-4).

chromatography, with confirmation by gas chromatography/mass spectrometry. Of course, all of the specimens were decomposed and heavily contaminated with embalming fluid.

The news media reported that the principle drug consumed by the victims was cyanide, and indeed cyanide was found in Bodies A001 and A006. The cyanide was determined with an ultraviolet spectrophotometer by measuring an ionic tetracyanonickelate complex, as described by Scoggins [4]. Both the decomposition and the embalming fluid created problems in evaluating the cyanide concentrations. A mixture of sodium or potassium cyanide and formaldehyde at room temperature undergoes condensation and hydrolysis to evolve ammonia and forms the alkali salts of glycolic acid, glycine, iminodiacetic acid, and nitrilotriacetic acid [5]. It was thought that glycolic acid could possibly be used as a marker to identify that cyanide had been present in the tissues even after the cyanide had been destroyed. Glycolic acid was indeed found within the tissues of these bodies by high-pressure liquid chromatography, but glycolic acid was also found within a control sample of tissues prepared by putting decomposed tissue that was not exposed to cyanide in formaldehyde. Cyanide is also known to disappear in the postmortem state secondary to evaporation, thiocyanate formation, and cyanide combining with tissues [6]. A small amount of cyanide is also produced by postmortem decomposition [7,8]. Because of these factors it was very difficult to assess the meaning of the cyanide values found in the two bodies. The amount of cyanide that was found is listed in Table 2.



FIG. 10—Wound edge approximated on Body A001 (AFIP Neg. 85-8921-5).

Table 3 provides an example of the distribution of drugs in the tissues of one of the bodies. Except for chloroquine, which was most likely given for malaria prophylaxis, all of the drugs that were found had a higher value in the stomach than in the other tissues. This indicates that the drugs were ingested and still in the absorptive phase of distribution.

Cause and Manner of Death

Bodies B013 and A001 had gunshot wounds to the head that were certainly sufficient to be the cause of death. Cyanide was also identified in the muscle of Body A001. There are several explanations for finding cyanide along with the gunshot wound to the head. One explanation is that after taking the cyanide the person did not die as quickly as expected and either shot himself or someone else did. Another explanation is that the person did die of cyanide intoxication and someone else inflicted the wound after death. Actually, the cause of death in this instance was listed as a combination of cyanide intoxication and gunshot wound to the head.

The cause of death in the other 5 cases was listed as acute cyanide intoxication even though cyanide was actually identified in only 1 of the bodies (A006). Dr. Leslie Mootoo, the forensic pathologist who examined the bodies at the scene in Guyana, said he aspirated the stomach contents of 65 bodies at the scene and all 65 were positive with a field test for cya-

TABLE 1—Toxicologic results.

Body	Drugs Present						
	Cyanide	Promethazine	Chlorpromazine	Chloroquine	Diphenhydramine	Pentobarbital	Salicylates
A002		X	X	X	X		
A001	X			X			
B013				X		X	
I054			X	X	X		X
A097				X			
A006	X		X	X	X		
A024				X			

TABLE 2—Cyanide.

Body	Tissue	Amount, mg/100 g
A001	muscle	0.2
A006	brain	0.08

TABLE 3—Example of the drug distribution in the tissues of one body (mg/100 g).

Drug	Tissue					
	Stomach	Lung	Spleen	Kidney	Liver	Brain
Diphenhydramine	0.98	0.02	0.02	0.03	0.54	0.02
Promethazine	1.31	0.02	0.04	0.19	0.70	0.05
Chlorpromazine	40.9	0.22	0.23	1.05	3.12	0.13
Chloroquine	NR ^a	NR	NR	NR	8.3	NR

^aNR = none reported.

nide; this was later confirmed in the laboratory [9]. This scientific evidence along with all of the circumstantial evidence makes it reasonable to conclude that acute cyanide intoxication was the cause of death in these cases.

The manner of death in the cases of the seven bodies that were autopsied was listed as undetermined. It is debatable whether these persons actually took cyanide of their own free will or were strongly coerced. It is also not possible to state accurately the manner of death in the cases of the two gunshot victims because the circumstantial evidence indicates they could have been suicides or homicides.

Identification

Of the 913 bodies examined, 666 (73%) were identified. Table 4 lists the methods by which these bodies were identified. The adults of this group were fingerprinted when they arrived in Guyana. These fingerprints in the immigration records accounted for the large number of identifications made possible through fingerprints. As evidenced by the small number of persons identified by their dental records, only a few dental records were received from either Guyana or the families in the United States.

Although total body X-rays were of significant help in identifying the crash victims of two Boeing 747s in the Canary Islands [10, 11], there is a significant difference in the availability of premortem X-rays in the two incidents. In the Canary Islands crash, premortem X-rays were readily available, while in the Guyana incident very few were available; for this reason, total body X-rays were not obtained on all of the victims. As might be expected, the infants and small children were the most difficult to identify. Even after all the bodies had been embalmed, X-raying the carpal bones of infants to identify centers of ossification was considered; this idea was abandoned, however, after a review of the available premortem records revealed that many of the infants were the same age or very close in age.

On 2 Dec. 1978, the majority of the team departed Dover Air Force Base, leaving a small number of pathologists, dentists, and technicians to correlate the data and make the final identifications. This smaller team finished their work at Dover on 20 Dec. 1978.

TABLE 4—*Methods used in the identification of the Jonestown bodies.*

Method	No. of Bodies
Fingerprints only	441
Fingerprints and dental records	150
Dental records only	73
Pathology (amputee)	1
Footprint	1
Total	666

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References

- [1] "Nightmare in Jonestown," *Time*, 4 Dec. 1978, pp. 16-27.
- [2] "The Cult of Death," *Newsweek*, 4 Dec. 1978, pp. 38-53.
- [3] Kirkham, W. R., Andrews, E. E., Snow, C. C., Grape, P. M., and Snyder, L., "Postmortem Pink Teeth," *Journal of Forensic Sciences*, Vol. 22, No. 1, Jan. 1977, pp. 119-131.
- [4] Scoggins, M. W., "Ultraviolet Spectrophotometric Determination of Cyanide Ion," *Analytical Chemistry* (Washington), Vol. 44, 1972, p. 1294.
- [5] Walker, J. F., *Formaldehyde*, 3rd ed., Reinhold Publishing Corp., New York, 1964, p. 242.
- [6] Ballantyne, B., Bright, J. E., and Williams, P., "The Post-Mortem Rate of Transformation of Cyanide," *Forensic Science* (Lausanne), Vol. 3, 1974, pp. 71-76.
- [7] Curry, A. S., Price, D. E., and Rutter, E. R., "The Production of Cyanide in Post Mortem Material," *Acta Pharmacologica et Toxicologica* (Copenhagen), Vol. 25, 1967, pp. 339-344.
- [8] Ballantyne, B., "Changes in Blood Cyanide as a Function of Storage Time and Temperature," *Journal—Forensic Science Society* (London), Vol. 16, 1976, pp. 305-310.
- [9] Mootoo, L., "Forensic Aspects of the Investigation of the Deaths at Jonestown, Guyana," oral presentation at the 31st Annual Meeting of the American Academy of Forensic Sciences, Atlanta, GA, 12-17 Feb. 1979.
- [10] Reals, W. J. and Cowan, W. R., "Forensic Pathology and Mass Casualties," *Human Pathology*, Vol. 10, No. 2, March 1979, pp. 133-136.
- [11] Wolcott, J. H. and Hanson, C. A., "Summary of the Means Used to Positively Identify the American Victims in the Canary Islands Crash," *Aviation, Space, and Environmental Medicine*, Vol. 51, No. 9, Sept. 1980, pp. 1034-1035.

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