

Dr. Roger Amy, Department of Pathology, University of Alberta

Report on the Exhumation of John Torrington
Deceased January 4, 1846

John Torrington was buried 1.5 m. below the surface in a wooden coffin covered with navy blue felt. He was clothed in a shirt and trousers and was lying on a bed of wood shavings. The frozen body was encased in ice.

Because of the low temperature (0° C) and high wind (15 knots), it was necessary to thaw the ice and portions of the body with warm water. Dissection was carried out beside the grave site, and, following dissection, the body was re-interred and the grave reconstructed. Preparation of the body took approximately 11 hours.

The body was opened through a Y incision, the ribs were cut in the standard autopsy fashion, the body cavities were examined, and samples of parenchymal organs, except for the pancreas and adrenal glands, which were not identified, were removed, and the brain and meninges examined. Samples of hair and fingernails were taken.

The organ samples, fixed in 10% formalin, were later blocked, prepared, and stained with hematoxylin-eosin. Sections of lung, liver, heart, and bowel, were stained by the periodic-acid Schiff (PAS) reaction and with elastic and connective tissue stains . . .

The body was 162.6 cm. long, and its estimated weight was less than 40 kg. He was a small man and appeared emaciated, partly owing to postmortem dessication. He was clean-shaven and had long brown hair, which had separated from his scalp. There were no cutaneous lesions, and there was no external evidence of trauma; in particular there were no wounds, scars, ligature marks, fractures, or amputations. The face, eyes, scalp, and skull were intact. Dental caries were present, and all four first molars were missing, likely from periapical abscesses. The meninges of the brain were intact and not pigmented. The brain was autolyzed, and only yellow granular fluid remained. The marked autolysis of the brain suggests that decedent had been kept warm for a while after death, possibly while being prepared for burial while the grave was dug.

The lungs were bound to the chest wall by pleural adhesions. No masses were palpated in the apices or roots of the lungs. Sections of the lungs showed variable preservation of the parenchymal architecture and good focal preservation of alveoli and of a bronchus. Anthracosis was present, sometimes associated with antemortem alveolar septal destruction; this gave an appearance of centriacinar emphysema. There was a patchy, questionable increase in the amount of connective tissue, possibly an artefact of postmortem collapse. Intra-alveolar eosinophilic material, possibly an exudate, was present in one section. A fibrocalcific granuloma may have been caused by tuberculosis or a fungal disease. Ziehl-Neelson and Gomori-methenamine-silver staining showed no organisms.

The heart, after fixation, weighed 110 g and although shrunken, was architecturally well-preserved. The coronary arteries were patent, and no calcified plaques were identified. The atrioventricular, pulmonary, and aortic valves were well preserved. There was no evidence of scarring, calcification, or vegetations on the valve cusps.

Histologic sections of myocardium showed complete loss of cellular detail.

The general outline of the intra-abdominal viscera was maintained, and there were no fibrous adhesions. The appendix was unremarkable. Microscopic examination of portions of the stomach and small and large bowel revealed no abnormalities. The layers of bowel were easily identified, although all nuclei and epithelial tissue had disappeared. No feces were found. The pancreas was not found, probably because of postmortem autolysis. There was no evidence of enzymatic fat necrosis. The liver was shrunken. No calculi were present in the gallbladder. Histologic preservation of the liver was poor, though the gallbladder wall was distinct. No free blood was present in the great vessels or in the abdominal cavity. The spleen was shrunken and had lost histologic detail. Bone was well preserved, but the bone marrow was almost completely autolyzed. The shape of the kidneys was preserved, though histologic detail lost. The uterers were not identified, and no calculi were found in the bladder or kidney. The external genitalia were unremarkable. Sections of pectoralis muscle were examined, and, though histologic detail was poor, no abnormality was found.

Numerous yellow-white nodules 1 mm or less in diameter were present in all organs and tissues and were composed of eosinophilic, amorphous and sometimes birefringent debris. The central regions of the nodules contained electron-dense, homogenous material, cellular debris, and some poorly defined structures suggestive of bacterial remains. Collagen fibres with clear 64-nm periodicity were scattered around the central region. Microanalysis of the hepatic nodules with energy-dispersive radiography showed evidence of sodium, iron, magnesium/arsenic, chlorine and calcium. The magnesium/arsenic peak was due to the cacodylate buffer. Silica was not identified.

Samples of rib, clavicle, and radius were analyzed for lead and mercury content with an electrothermal atomic absorption method (based on dry weight). The levels of lead varied from 110 to 151 parts per million (ppm) (normally 5 to 14 ppm) and those of mercury from 0.03 to 1.44 ppm (normally less than 0.17 ppm). The elevated lead level corresponds with the level of 228 ppm found in occipital bone from one of the Franklin crewmen who died on King William Island. The significance of the elevated levels in determining the course of the expedition remains uncertain.

Discussion

No specific cause of Torrington's death could be identified, although, because of the pleural adhesions and intra-alveolar exudate, pneumonia is likely. The possibility of a traumatic cause of death other than exposure was largely eliminated by postmortem examination. Abnormalities identified included emaciation, partially artefactual, pleural adhesions, possible centriacinar emphysema, and "old" pulmonary granuloma, possible intra-alveolar exudate, anthracosis and dental caries. The peculiar yellow-white granules in the tissues probably represented a breakdown product of gradual autolysis. Elements commonly found in normal tissues were detected in the nodules by microanalysis with energy-dispersive radiography.

The autopsy findings do not illuminate the events that led to the loss of the remaining members of the expedition in 1847 and 1848.

Current elemental analysis of hair, bone, and nail samples may add information on the health and the dietary characteristics of the crew.*

* Later analysis of lead levels from Torrington's hair gave a figure of over 600 parts per million of lead, which would indicate acute lead poisoning, though the levels were lower in the last few centimetres (possibly as a result of decreased intake of tinned food in his last few weeks of life).