



NatSCA

Natural Sciences Collections Association

<http://www.natsca.org>

NatSCA News

Title: Zinc Chloride in Liquid Preservation

Author(s): Gregersen, K. M.

Source: Gregersen, K. M. (2007). Zinc Chloride in Liquid Preservation. *NatSCA News, Issue 11, 2 - 4.*

URL: <http://www.natsca.org/article/215>

NatSCA supports open access publication as part of its mission is to promote and support natural science collections. NatSCA uses the Creative Commons Attribution License (CCAL) <http://creativecommons.org/licenses/by/2.5/> for all works we publish. Under CCAL authors retain ownership of the copyright for their article, but authors allow anyone to download, reuse, reprint, modify, distribute, and/or copy articles in NatSCA publications, so long as the original authors and source are cited.

Zinc Chloride in Liquid Preservation - Kristian Murphy Gregersen

B.Sc. in Conservation, The Royal Danish Academy of Fine Arts, School of Conservation, Department of Natural History, Graduate Program, Esplanaden 34, DK-1263 Copenhagen K., Denmark.

Abstract:

For economical reasons, zinc chloride had been used as a substitute to alcohol for the preservation of anatomical and biological specimens in the 19th century. This led to the degradation of many specimens, amongst other a great number of type specimens of sea snakes held at the Natural History Museum, London. The use of zinc chloride however seems to have changed around the time of the British Spirits Act in 1855, where after zinc chloride found a use as a specifically good fixative/preservative for brain tissue.

Introduction:

An investigation of the type specimen collection of sea snakes held at the Natural History Museum, London, in 2004, revealed that at least 75 % of the type specimens from before 1855 had suffered from decalcification due to preservation in zinc chloride (the details of the analysis will be presented in a paper at a later date). None of the specimens that were collected later than 1855 had any signs of decalcification, which led to an investigation into the history of zinc chloride as a preservative. This paper presents the introduction and use of zinc chloride as a preservative, but will only deal with the 19th century, and will not concern the use of zinc chloride to-day.

Burnett's Solution:

Sir William Burnett (1779–1861), Director-General of the Naval Medical Department, was a Scottish surgeon who rose to the highest ranks within the British Royal Navy. He gained high admiration for his treatment of British prisoners of war, and his very effective methods in treating the sick and wounded. At periods he was stationed at the Royal Naval Hospital, Haslar, in Portsmouth. Here he opened a library and a museum, and built up a considerable collection of natural history specimens, housed at the Haslar Museum until its transfer to the Natural History Museum, London, in 1855. (Anonymous 1833, Anonymous 1850, Anonymous 1861)

On the 26th of July 1839 Burnett received the approval of his patent application from 1838, entitled "*Improvements in preserving wood and other vegetable matters from decay*" (Burnett 1838). His invention makes the use of zinc chloride (1 pound of zinc chloride to 5 gallons of water) to preserve wood, canvas, cordage, sailcloth, hemp, flax etc., simply by soaking the object in the solution (Burnett 1838), thus hardening and improving the texture of the material greatly (Anonymous 1847). Later it was observed to be efficient as an antiseptic remedy in the treatment of wounds, ulcers, and bad odour, and became known as *Burnett's Solution* (Wallace 1848, Anonymous 1861, de Morgan 1866, Crace-Calvert 1872a&b, Anonymous 1905) with the specific gravity of 1.343 (Rolleston 1879).

A preserving agent for biological specimens:

At some point, soon after the application of zinc chloride as an antiseptic, it seems to have caught on as a liquid for the preservation of anatomical and zoological specimens ("A Student" 1848, Bryson 1848, Anonymous 1872, Anonymous 1877). It was cheaper than alcohol, which was heavily taxed, and easy to carry around in the form of a powder soluble in water (Nassau 1892). It was clearly used at the Haslar Museum (Günther 1912) due to the influence by Burnett, but otherwise there are no direct suggestions that show other institutions used it. In fact, the only citations I have been able to find on the use of zinc chloride as a preservative are all concerned with the preservation of whole human bodies for dissection. It could be due to the fact that very little was published about conservation in those days, and that my main source, *The Lancet*, is a medical journal. It might also be due to observations of its bad effect on the specimens preserved in the liquid, evident from a footnote on page 5 of Günther's (1912) "*General History of the Department of Zoology*" :

" † The zoological collection at the Haslar Hospital (...) were in very bad condition, as for economy's sake a solution of chloride of zinc had been used instead of alcohol!"

Even so, most of the type specimens of sea snakes at the Natural History Museum, London, had been preserved in this way, suggesting they must have used the same liquid.

Though it never really seems to have caught on as a general preservative, it seems to have been preferred as a fixative/preservative for brains and other nerve tissue. Chapman (1880) used it to preserve brains of gorillas, and John B. Roberts (1885), M.D., used brains from whole human cadavers preserved in zinc chloride. Professor von Bischoff of Munich had in 1868 used it to preserve brains for 24 years and found it far superior to alcohol, and the Oxford Museum also used it as a brain preservative (Rolleston 1879). Zinc chloride resulted in much shrinkage of the tissue though, and some found it better to use it as a fixative, before transferring the brain to a different solution for preservation. Professor Turner (1879) used this method and would fix the brain in a saturated solution of zinc chloride before transferring to alcohol, and later glycerine and carbolic acid solution, before finally varnishing it with gum elastic or marine glue. Parker and Floyd (1895) also noted the shrinkage effect of zinc chloride and tried to find a mixture that would prevent this. Formaldehyde had recently emerged as a fixative, but had the effect of swelling the nervous tissue. Therefore Parker and Floyd tested them together but found that the results were not satisfactory, and advised against the use of zinc chloride. Pierre A. Fish (1896) followed up on the same idea as Parker and Floyd and but thought of adding sodium chloride to make the following fixative:

Water,	2000 cc.
Formalin,	50 cc.
Sodium chloride,	100 grams
Zinc chloride,	15 grams

The mixture should have the specific gravity of 1.05 and the brain should be fixed in the solution for c. 10 days, before transferring to formaldehyde or alcohol for storage.

Discussion:

Burnett found the usefulness in zinc chloride as a preservative and, probably through his position in the Royal Navy (Anonymous 1861), boosted the use of it within the navy. There was a very high tax on alcohol in those days which also induced the replacement of such with a far cheaper remedy. It is probably safe to venture that all of the specimens held at Royal Hospital Haslar were preserved in zinc chloride, and if one takes a look at the collectors of the type specimens of sea snakes held at the Natural History Museum, London, most of them were collected by people like Major-General Thomas Hardwicke (1755-1835), Admiral of the British Royal Navy Sir Edward Belcher (1799-1877), and Surgeon Major Thomas C. Jerdon (1811-1872), all connected with the British Military and therefore under heavy influence from Burnett. The only odd-one-out is Major-General Hardwicke, who died before Burnett got his patent in 1839, and before zinc chloride was found to have antiseptic properties. The only explanation for this is that the original preservative for those specimens must have been replaced by zinc chloride at a later time. A very thorough book on the preservation of anatomical specimens by Usher Parsons (1831) suggests that zinc chloride was not a known preservative, or even used as a salt added to preservatives, before Burnett got his patent.

In 1855 the *British Spirits Act* was passed, removing the tax from alcohol for industrial use after the addition of methanol which made it un-suitable for consumption. This type of alcohol is referred to as Industrial Methylated Spirit (IMS) and quickly caught on as the substitution for the more expensive alcohol and is still utilised by the Natural History Museum, London. This co-elates with the results of the investigation of the type collection of sea snakes, which found that the signs of decalcification due to the action of zinc chloride were not to be found in specimens later than 1855, suggesting that shortly after the tax was lifted on industrial alcohol, zinc chloride went out of fashion, except as a brain fixative/preservative. This was likely due to the observations of the ill effects it had on the specimens, like Günther (1912) mentions.

Zinc chloride enjoyed but a short period as a general preservative (c. 30 yrs.), and only, it seems, within the British realm.

References:

- **Anonymous. 1833.** Sir William Burnett. Certificates of election and candidature. *Reference no. EC/1833/05.* The Royal Society of London.
- **Anonymous. 1847.** Preservation of Timber, Hemp, Linen, &c., by Sir William Burnett's Method. *Journal of the Franklin Institute*, vol. 43, no. 1, pp. 67-68.
- **Anonymous. 1850.** Biographical sketch of Sir William Burnett, K.C.B. K.C.H. M.D. F.R.S. Director-General of the Medical Department of the Navy. *The Lancet*, vol. 56, no. 1420, pp. 558-563.
- **Anonymous. 1861.** The late Sir William Burnett, K.C.B., K.C.H., M.D., F.R.S.. *The Lancet*, vol. 77, no. 1956, pp. 200-201.
- **Anonymous. 1872.** Preservation of bodies for dissection at the London hospitals. *The Lancet*, vol. 100, no. 2526, pp. 504-505.
- **Anonymous. 1877.** Preservation of subjects for dissection. *The Lancet*, vol. 110, no. 2825, p. 585.
- **Anonymous. 1905.** The limitations of chloride of zinc as a deodorant, antiseptic, and germicide. *The Lancet*, vol. 166, no. 4293, pp. 1718-1719.
- **A Student. 1848.** Disinfection. *The Lancet*, vol. 51, no. 1271, p. 53.
- **Bryson, A. 1848.** On the use of Sir W. Burnett's chloride of zinc in the performance of dissections. *The Lancet*, vol. 51, no. 1272, p. 81.
- **Burnett, W. 1838.** Preserving wood, &c. *British Patents No. 7747.* Printed in 1857 by George E. Eyre and William Spottiswoode. The Great Seal Patent Office. London.
- **Chapman, H.C. 1880.** The brain of the Orang. *Science*, vol. 1, no. 27, pp. 326-328.
- **Crace-Calvert, F. 1871-1872a.** On the relative power of various substances in preventing putrefaction and the development of protoplasmic and fungus-life. [Abstract]. *Proceedings of the Royal Society of London*, vol. 20, pp. 187-191.
- **Crace-Calvert, F. 1871-1872b.** On the relative power of various substances in arresting putrefaction and the development of protoplasmic and fungus-life. [Abstract]. *Proceedings of the Royal Society of London*, vol. 20, pp. 191-192.
- **Fish, P.A. 1896.** The use of formalin in neurology. *Transactions of the American Microscopical Society*, vol. 17, pp. 319-330.
- **Günther, A.C.L.G. 1912.** General History of the Department of Zoology from 1856-1895. Appendix in: *The History of the Collections contained at the Natural History Department of the British Museum.* Vol. 2. British Museum. London.
- **de Morgan. 1866.** The application of chloride of zinc in solution to surgical and accidental wounds; remarks upon some cases. *The Lancet*, vol. 87, no. 2224, pp. 398-399.
- **Nassau, R.H. 1892.** Collecting Gorilla brains. *Science*, vol. 19, no. 482, pp. 240-241.
- **Parker, G.H., and R. Floyd. 1895.** The preservation of mammalian brains by means of formol and alcohol. *Anatomischer Anzeiger*, vol. 11, no. 5, pp. 156-158.
- **Parsons, U. 1831.** *Directions for making anatomical preservations.* Pp. 316. Carey and Lea. Philadelphia.
- **Roberts, J.B. 1885.** The field and limitation of the operative surgery of the human brain. *Annals of Surgery*, vol. 2, no. 7, pp. 1-22.
- **Rolleston. 1879.** Note on the preservation of encephala by the zinc chloride. *Journal of Anatomy and Physiology*, vol. 13, no. 2, pp. 232-233.
- **Turner. 1879.** Report on recent memoirs on the anatomy of the brain. *Journal of Anatomy and Physiology*, vol. 13, no. 2, pp. 266-289.
- **Wallace, R. 1848.** Treatment of ulcers by chloride of zinc. *The Lancet*, vol. 51, no. 1271, p. 54.