



History of medicine

Chimney-sweeps' cancer—early proof of environmentally driven tumourigenicity

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We declare no competing interests.

For more on **Percivall Pott early reports** see Pott P. Chirurgical observations. London: Hitch & Hawes, 1775: 61; and *Urology* 1975; 6: 745-49

For more on the **classification of tar component and halogenated hydrocarbons as carcinogens** see <https://ntp.niehs.nih.gov/go/roc14/>

For more on the **experiments of Yamagiwa** see *Cancer Sci* 2014; 105: 143-9

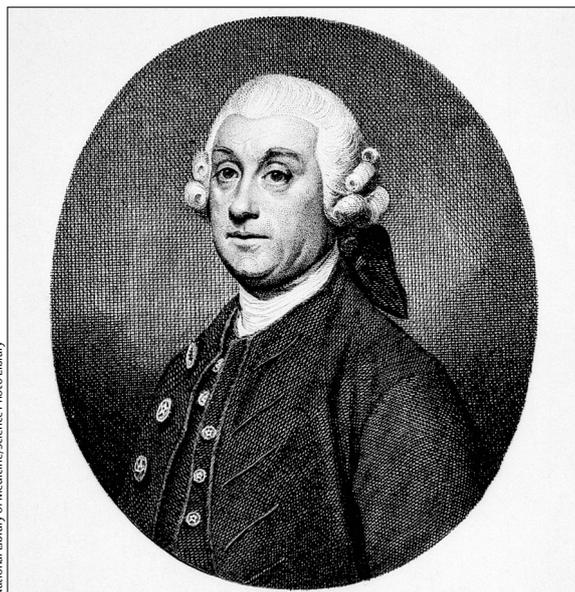
So-called chimney-sweep cancer was a particularly common condition in 18th century Europe. Traditionally, chimney sweeps hired young boys, generally orphans or children from poor families, who were small and could climb inside the chimney to brush it. Although chimney sweeping was common across Europe and North America during the 18th century, chimney-sweep cancer was predominantly found in English chimney sweeps, probably because the chimney flues were narrower and Londoners often hired young boys aged between 4 and 7 years who could fit through the ducts. Additionally, the poor hygiene conditions at the time meant that these children would bathe normally once a year and would often work naked, repeatedly exposing their skin to toxins in the chimney soot. In England at that time there was no law regulating child labour and the first Chimney Sweepers Act was passed in 1788, stating a minimum working age of 8 years. The British Parliament, concerned about child labour exploitation in this setting, passed a law in 1834 prohibiting children younger than 10 years to work, and children younger than 14 years to be engaged in cleaning chimneys. In 1840, the law changed and the minimum age of apprenticeship for chimney sweeps was 16 years. However, as with previous legislation, these age thresholds were largely ignored because of the lack of enforcement and children under the age of ten were still hired

to clean chimneys. In France, worried by social injustice, the novelist and human rights activist Victor Hugo (1829-83) denounced the exploitation and slavery of children in 1862, through the character of Cosette in his novel *Les Misérables*. In his novels, Hugo tried to raise public awareness of the lack of enforcement of laws passed in countries in the middle of the industrial revolution.

We report on an anatomical wax model (not shown) from the medical Dupuytren museum (Paris, France) with no linked archive information, which appears to be a squamous cell carcinoma of the skin surrounding the testicle, also called chimney-sweep cancer. We also found a specimen preserved at the Barts Pathology Museum (London, UK), which represents an authentic chimney-sweep cancer as explained by Percivall Pott (1714-88; St Bartholomew's Hospital, London, UK), an English surgeon who first proposed that cancer could be caused by environmental carcinogens. In 1775, Pott noted that testicular cancers were commonly observed in adult Londoners who had one thing in common: all of them were chimney sweeps as children. He therefore hypothesised that chronic irritation of the testicular skin by soot and chimney tars might have been the cause of these cancers. To limit the extension of the disease to the testicles and lymph nodes, Pott recommended early surgical excision and denounced mercury-based local topics used by his colleagues who were erroneously persuaded of the venereal origin of the disease. This anatomical piece could have been kept at the Barts Pathology Museum as a result of an orchiectomy performed by a surgeon working at St Bartholomew's Hospital, perhaps Pott himself.

Even though chronic tar exposure and some halogenated hydrocarbons derived from chimney soot are now defined as carcinogens for humans and are a risk factor for squamous cell carcinoma, it is important to remember that their definition was only confirmed 140 years after Pott's first communication. Between 1914 and 1916, Japanese pathologist Katsusaburo Yamagiwa (1863-1930) and his assistant Koichi Kishikawa (1888-1948) did pioneering experiments into the cause of cancer, and for the first time induced an experimental squamous cell cancer model by repeatedly applying tar to the skin of rabbits' ears.

One must always bear in mind the relationship between cancer and the environment, and be grateful to these scientists who pave the way to the discovery of those carcinogenic toxins.



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Percivall Pott, British surgeon. Pott found an association between exposure to soot and a high incidence of scrotal skin cancer in chimney sweeps. This cancer is now known as Pott's or chimney sweep cancer.

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