The Right Chemistry: Mad Hatters were not merely fictional

Use of certain chemicals in traditional felt hat-making, paint stripping and nail salons poses occupational hazards.

Some stories are just too good to fact-check. Like the one linking felt hats to syphilis. Felt is produced by pressing moistened fibres such as wool or fur together to form a matted material, a process that dates back to the ancient Sumerians. In Turkey, traditionally camel hair was used, with urine from the same animal as the wetting agent. Apparently, it contains compounds that speed up the process. Urine in felt-making was adopted in France sometime in the 17th century, with workers using the most easily available source, their own bladders.

One worker, as the story goes, was being treated with mercury, probably mercurous chloride (calomel), for syphilis and consistently produced superior felt. Various forms of this element had been the treatment of choice for syphilis, first popularized in the 16th century by Paracelsus, he of “the dose makes the poison” fame. Patients were rubbed with mercury ointments, exposed to vapours of the heated metal, or made to consume various mercurial concoctions. All these treatments resulted in spectacular salivation that was believed to rid the body of the poison that caused the disease. Often the treatments did manage to end the suffering. The dead feel no pain.

While the origin of using mercury to make better felt may be debatable, it is clear that by the mid-17th century mercuric nitrate, made by treating mercury with concentrated nitric acid, was being used to make felt, particularly for men’s hats. The process, known as “carroting,” involved heating beaver or rabbit skins with mercuric nitrate until the fur began to show an orange tinge. At this point, the fleece was readily removed, felted, and shaped into hats. Workers paid a heavy price, as hatting resulted in widespread cases of mercury poisoning. Psychiatric symptoms were common, as exemplified by the “Mad Hatter” in Lewis Carroll’s Alice in Wonderland. Hatters’ disease was not limited to Europe. In Danbury, Connecticut, the centre of the United States’s hat making industry, workers often developed tremors and were said to suffer from the “Danbury shakes.”

Mercury toxicity affecting hatters is a classic example of an occupational hazard, one that was eliminated in 1941 when the United States Public Health service finally banned the use of mercury in the felt industry. However, there are numerous other occupations that make use of chemicals that can affect the health of workers. Methylene chloride, a common ingredient in paint strippers, is one. The International Agency for Research on Cancer

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(IARC) ranks it as “probably carcinogenic to humans,” meaning that there is likely to be a risk if exposure is sufficient, as may be the case for professional painters, furniture strippers and workers in car body shops. However, that isn’t the major concern. Inhaling the fumes of methylene chloride, as can readily happen in a confined space, can trigger heart attacks. This isn’t theory, it is fact.

More than 50 cases of sudden death have been linked to the buildup of methylene chloride fumes in occupational environments, but some weekend handymen have also succumbed. The European Union has banned the sale of methylene chloride in stores, but it is readily available both in Canada and the United States. After years of studying the problem, the U.S. Environmental Protection Agency proposed a ban on direct sales to consumers in 2017, but the current administration has placed a decision on the back burner. The large methylene chloride industry has argued that better instructions on the label can lead to safe use, even though the EPA concluded that dozens of studies “found that consumers and professionals do not consistently pay attention to labels for hazardous substances.” So it remains a case of “buyer beware.” And if you are planning to use methylene chloride, you better beware. Alternatives based on methyl acetate, dimethyl sulfoxide, thiophene, benzyl alcohol and some soy derivatives are being explored, but so far have not rivalled methylene chloride in efficacy.

Nail salons are also a concern when it comes to occupational hazards. Workers are exposed to what the media has referred to as the “toxic trio” of toluene, formaldehyde and dibutylphthalate (DBP). The latter is a “plasticizer” used to make nail polish pliable and less brittle. Some phthalates, including dibutyl phthalate, have hormone-like properties and have been termed “endocrine disruptors,” based on animal studies. DBP is not allowed in cosmetics in Europe and is being phased out here as well, although replacements such as triphenylphosphate may also have similar properties.

There is much confusion about formaldehyde, a potentially toxic gas. It is not found in nail polish! A resin made from formaldehyde is used to make nail lacquer resilient and long lasting, but this is a totally different substance. Solvents, such as ethyl acetate, butyl acetate, acetone and particularly toluene, used to dissolve nitrocellulose, the main film-forming polymer in nail polish, are legitimate hazards, as is acrylic powder used in gels. Nail salon workers should use appropriate masks. Obviously, occupational risks can be real nail-biters.

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