The pill rolling machine

Edwin CL Yu, FHKAM (Paediatrics), Reg CMP
Croucher Fellow, Honorary Professor, School of Chinese Medicine, Hong Kong Baptist University; Vice-Chairman, Hong Kong Museum of Medical Sciences Society

When studying neurology, a medical student will come across the term 'pill-rolling tremor' as a diagnostic sign of Parkinson's disease. It describes the resting tremor wherein the approximated thumb and forefinger rub rhythmically against each other in a rotating movement. In the study of orthopaedic surgery, he or she may encounter the term 'pill-roller hand deformity' where the pathological contracture of intrinsic muscles of the hand leads to persistent extension at the metacarpophalangeal joint and partial flexion of the inter-phalangeal joints.[1] These descriptive terms hark back to the 19th century when medicines were dispensed in the form of pills (from the Latin word *pillula* meaning 'little ball') manually rolled by professional pill rollers who were specially trained in the art of preparing and dispensing drugs.

The Art of Dispensing published in 1915 describes how pills were made.[2] A pill comprised a mixture of active ingredients mixed with a sufficient amount of some kind of paste or liquid to bind all into a spherical mass. The active ingredients could be liquids (eg essential oils), pastes (eg extract of belladonna), or powders (eg quinine sulphate or powdered rhubarb). Regardless of the physical state of the active ingredients, a powder of some kind was generally required so that the final mixture could be kept in a desirable solid form, yet sufficiently soft to be rolled into pills. Before the pill mass was to be rolled into pills, it was sometimes necessary to add some inert powder, such as liquorice or sugar of milk, with an appropriate excipient, to ensure that the required amount of active ingredient would be contained in each pill. The massing of pills was not simple. The professionally trained pill roller was endowed with the knowledge of the most appropriate excipient, the right type of mortar and pestle, and the proper kneading technique. The amount of active ingredient in the resultant 'pill mass' had to be recorded. For example, a pill mass might be labelled in Latin-English as 'Pulv. pro pil. hydrarg. subchlor. co., 4 grains equal 4 1/2 grains of pill-mass'. To paraphrase, it meant that four and a half grains of the pulverised pill mass contained 4 grains of mercuric chloride, the active ingredient.

The next stage was to produce the actual pill.

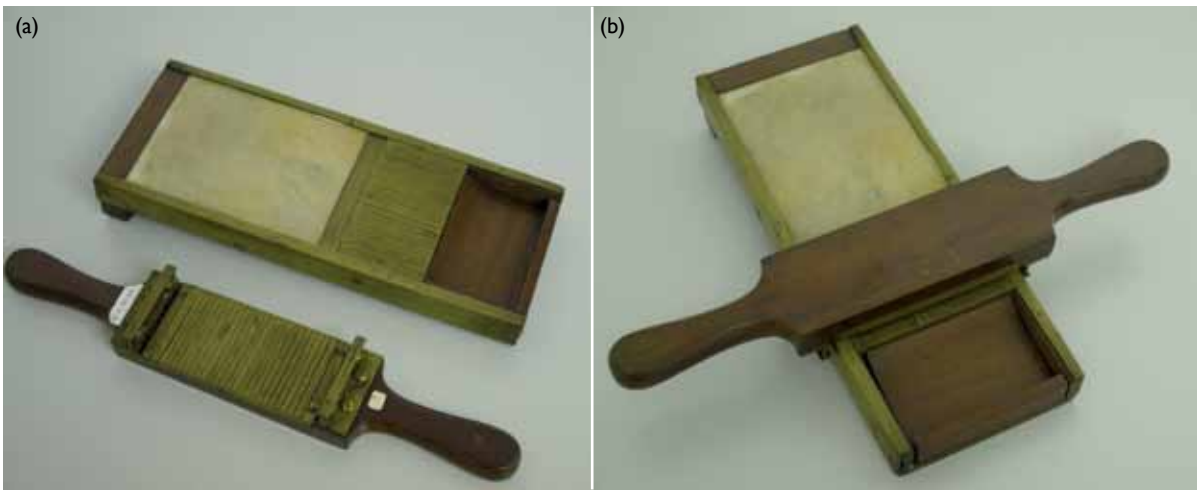

FIG. The pill machine manufactured by S Maw, Son & Thompson, London, England, and donated by the Nethersole Hospital to the Hong Kong Museum of Medical Sciences in 1996, showing (a) the baseboard and the under-surface of the handle and (b) the apparatus with handle in place for the cutting and rolling procedure

For a long time, this was entirely done by hand. The pill mass was rolled into the form of a cylinder, placed on a graduated tile and divided by means of a spatula into measured lengths calculated to contain the required amount of active ingredients. These were then rounded between finger and thumb to give the final product. Some time in the 19th century, the hand-operated pill machine such as the one previously used in the Nethersole Hospital (Fig) was employed. The cylinder of pill mass was placed crosswise on the grooved baseboard of the apparatus, and the two-handled cutter would be placed over it first to cut it into equal lengths. Rolling the top board to-and-fro over the cut pieces would then create spherical pills of equal size and dosage that were then collected in the sunken tray at the end of the baseboard. A 12-second videotaped illustration on the use of the pill roller is available on the internet.[3]

As in this specimen, the machine was, for a long time, made of wood. Thus over time, shrinkage of the frame would render the machine useless. The improved version of the pill machine with the baseboard fitted between metal sides was invented by AH Wirz and patented in 1867.[4]

Pill machines are no longer used in western medicine, but still common in China for making herb products. In the West, the apothecary is a historical name for a medical professional who investigated herbal and chemical ingredients, and formulated and dispensed *materia medica* to physicians and surgeons for their patients. From the 15th to 16th century, the apothecary gained the status of a skilled practitioner, but by the end of the 19th century, the medical professions in the West had taken on their current institutional form, with defined roles for physicians and surgeons, and the role of the apothecary was more narrowly conceived as that of a pharmacist (dispensing chemist in Britain).

In China, herbal medicinal products continue to thrive and herbal mixture must first be crushed, then ground. Automatic herbal pill–making machines are used in the bulk manufacture of herbal pills with the diameter set at 3 mm, 4 mm, 5 mm, 6 mm, or 7 mm. With fully automatic operation, the herbal pill–making machine is filled with herbal powder while honey or water is added. The mixed ingredients are shaped into pills by the roller, then dried, molded, and coated.

Today, herb decoction extracts in powder or granule form have largely replaced the old methods. Tablets are used. In a more developed technology, capsules are used to contain the herb ingredients in extracts. It must, however, be noted that boiling raw herbs remains a time-honoured tradition.

References

1. Steindler A. The pill-roller hand deformities due to imbalance of the intrinsic muscles, relief by ulnar resection. J Bone Joint Surg Am 1928;10:550-3.
2. MacEwan P. The art of dispensing. Chpt. Pills and their excipients general observations. Part 2. The Chemist and Druggist; 1915.
3. Tomlinson's chemists Lytham victorian pharmacist demonstrating making pills. Available from (demonstration starts at 0.55): http://www.youtube.com/watch?v=20omeQGKXLI. Accessed Jul 2009.
4. Patent of August H. Wirz of Philadelphia on October 1st 1867. US Patent 69,379. Available from: http://www.google.com/patents/US69379. Accessed Apr 2015.