

## Public Health Classics

This section looks back to some ground-breaking contributions to public health, adding a commentary on their significance from a modern-day perspective. To complement the theme of this month's *Bulletin*, Iain Milne and Iain Chalmers comment on James Lind's 1753 *Treatise of the scurvy*, an extract of which is reproduced in this section.

### Documenting the evidence: the case of scurvy

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In 1753, James Lind, a Scottish naval surgeon and medical graduate of Edinburgh University, published a 450-page, three-part *Treatise of the scurvy* (1). At that time, scurvy was killing thousands of people every year and was responsible for many more deaths of sailors in the Royal Navy than enemy action. Believing that one of the reasons there was so much confusion about the diagnosis, prevention and cure of scurvy was that “no physician conversant with this disease at sea had undertaken to throw light upon the subject”, Lind set about filling this gap, with a clearly stated commitment to base his work on “observable facts” rather than on the theories that dominated medical decision-making at that time.

Lind's *Treatise* is a classic for two main reasons: it is one of the earliest accounts so far identified of a prospectively organized controlled clinical trial, comparing six commonly used treatments for scurvy, and it is a systematic review of what had previously been published on the diagnosis, prognosis, prevention and treatment of scurvy.

While serving in the Channel Fleet aboard HMS Salisbury in 1747, Lind reports having selected 12 sailors who were all at a clinically similar stage of scurvy, had the same basic diet, and were accommodated in the same part of the ship. He allocated two each to six of the many different treatments for scurvy then in use: a quart of cider daily; 25 gutts of elixir vitriol three times a day; two spoonfuls of vinegar three times a day; half a pint of seawater daily; a concoction of nutmeg, mustard and garlic three times a day; and two oranges and a lemon daily. “The most sudden and visible good effects”, Lind reported, “were perceived from the use of oranges and lemons; one of those who had taken them being at the end of six days fit for duty ... The other was the best recovered of any in his condition; and being now deemed pretty well, was appointed nurse to the rest of the sick.” Although Lind does not provide any information on how he allocated the sailors to the six treatments he compared, he is rightly celebrated for having taken care to compare like with like: his report shows his awareness of the need to guard against selection bias, noting that potential confounding factors — clinical condition, basic diet and environment — had been held constant.

Although Lind is remembered for his controlled trial, his account of it fills only four pages in the book: the rest of it reports what had been published on the diagnosis, prognosis, prevention and treatment of scurvy. Lind's systematic review of the literature deserves greater recognition, particularly now that there is wide acceptance of the principle that decisions in health care and health policy should be informed by up-to-date, systematic reviews of reliable, relevant research.

The year after Lind conducted his clinical experiment at sea, he left the Navy and returned to Enlightenment Edinburgh, where he graduated in medicine at the University, obtained a licence to practise, and became a fellow (and subsequently treasurer) of the Royal College of Physicians of Edinburgh. It was during this time, when his home was most probably an apartment in Paterson's Court off Edinburgh's Royal Mile (2), that Lind did the research that he reported in his *Treatise*.

In the preface, Lind makes clear that he prefers observations to theory, stating bluntly: “before the subject could be set in clear and proper light, it was necessary to remove a great deal of rubbish”. Before critically appraising his predecessors' results and conclusions, he had to identify potentially relevant material. How did he succeed in bringing together almost all the available writings on scurvy? In Part III of his treatise he first provides an overview of “passages in ancient authors” before dealing with more recent writers in the “chronological view” of his *Bibliotheca Scorbutica*.

In the Appendix, Lind sets out the steps he took to identify potentially relevant material. He emphasizes the difficulties: “It has been no easy matter to obtain knowledge of the many writings on this distemper. There have been collections made from time to time, of the several authors on the plague, venereal disease, etc., but no such have been compiled of writers on the scurvy. There was here little assistance to be obtained from medical bibliothecae.”

Of the medical literature consulted by Lind 126 years before the publication of the first printed *Index medicus*, one of the secondary sources was Martin Lipen's 1679 *Bibliotheca realis medica* (3), which contained 29 writings on scurvy, and another was the bibliography compiled by Albert von Haller in 1751 (4).

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“The indefatigable Dr Haller published in his notes illustrating Boerhaave’s *Methodus* the titles of almost all medical writings now extant, no less than 30 000 volumes”, writes Lind. “But it were to be wished, that so good a judge had distinguished such books that (not being able to maintain their character) are now out of print, are occasional pamphlets or trifling academical orations, from writings of greater value.”

Lind’s search identified 54 books meriting critical appraisal. He then wrote abstracts summarizing his incisive views of the chosen books. For example, he considers the writings of Eugeleus, 1604 (5), to be untrustworthy: “This book must have been published by the author in a very loose immethodical dress; as it has undergone several corrections by different editors; and the order of the whole is still very inaccurate.”

Ever aware of continuity, Lind comments that Felix Platerus, 1608 (6), “seems not to have seen Eugeleus’ book, or at least has copied nothing from it for he still delivers the same description of the scurvy ... He recommends for prevention, as also cure, a confection of mustard-seed and honey; likewise the juice of oranges.”

Lind writes that the observations of Petrus Forestus, 1634 (7), “although extremely tedious, are valuable for the many truly scorbutic cases they contained”. Lind’s contemporary, Samuel Sutton, 1649 (8), gets gentler treatment: “The learned author very justly describes the most essential symptoms of the scurvy. He imagines the air even more than any other agent concerned in bringing on this calamity. He observes, that the disease is cured by vegetables. But as the design of this discourse is principally to demonstrate the usefulness of Sutton’s machine, he particularly insists upon the advantage that might reasonably be expected from it.”

The listing of many of the authors and their affiliations in a chronological index emphasizes just how far back Lind went — and, indeed, was able to go — in his search for potentially relevant material. Many of his sources were over 100 years old. His thoroughness is particularly noteworthy at a time when dependence on computerized databases means that important information published only a few decades ago may be overlooked, which can have tragic consequences. A young woman volunteer recently died in a research project partly because important information published during the 1950s had been overlooked (9).

It is also worth considering the implications of the medium — paper — used to record Lind’s sources. The Royal College of Physicians of Edinburgh still has entirely usable copies of 31 of the 54 sources identified by Lind, 19 of which were already in its collection during his Edinburgh stay. It remains to be seen whether the digital records of the 21st century will survive so well (10).

The least satisfactory feature of Lind’s *Treatise* is that he leaves his readers confused about his recommendations. Some passages suggest that he is very clear about the implications of his review, for example when he writes: “Some new preservative against the scurvy might in this treatise have been recommended; several indeed might have been proposed, and with great show of probability of their success; and their novelty might perhaps have procured them a favourable reception in the world. But these (citrus) fruits have this peculiar advantage above anything that can be proposed for trial, that their experienced virtues have stood the test of nearly 200 years.” The number of times each of the six purported treatments compared in the experiment is mentioned in his book should leave little doubt about his preferences: 117 mentions of orange(s) or lemon(s), 29 of vinegar, 29 of vitriol, 19 of seawater, 16 of cyder/cider, and 2 of nutmeg. In spite of these apparently clear indications of Lind’s conclusions, however, his readers are left wondering whether he regards fruit and vegetables as relatively more important than fresh air — one of the other factors that he cites as crucially important in preventing and treating scurvy. This is probably one of the reasons that it took so long for oranges and lemons to be widely recognized as antiscorbutics.

Although Lind’s *Treatise* was published in three editions in English (1753, 1757 and 1772), two in French (1756 and 1783) and one each in Italian (1766) and German (1775), it was not until a year after Lind’s death in 1794 that the Admiralty issued a general order sanctioning the provision of lemon juice in the navy on a far more generous scale than previously. The effects of the Admiralty’s order were dramatic: within two years scurvy had more or less disappeared from the Royal Navy. Today there are a variety of reasons why research evidence has little or no impact on policy and practice. It seems likely that similar problems also existed in the years after the publication of Lind’s classic work. ■

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