James Lind’s *Treatise of the Scurvy* (1753)

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Lind is revered as the first doctor to conduct systematic clinical trials of potential cures for scurvy—trials in which oranges and lemons came out as decisive winners. The following paper argues that our modern understanding of scurvy and vitamin C has hindered our understanding of Lind’s own conception of his work and of the place within it of his clinical trials. Lind conceived of scurvy not as a disease of dietary deficiency, but of faulty digestion. In the full context of his *Treatise of the Scurvy*, and of his own medical practice, the seeming decisiveness of the trials fades, to be replaced by a sense of Lind’s bafflement at the nature of the disease to which he had devoted his career.

The chief concern of traditional histories of medicine has been “who got the right answer first?” Guided by our certainties about what has turned out to be the truth, we arrange the past into a parade of heroes and heroines who were clever enough, or inspired enough, or lucky enough to have erected the medical monuments that line the road that leads to us. James Lind (1716–94) has an established place in the parade. The standard account of Lind’s work runs as follows. His search for a cure for scurvy culminated in a set of clinical trials of potential cures for the disorder. Lind’s trials, which he called “experiments”, are held to be the very first systematic clinical trials of any sort. Not surprisingly, they lack the absolute rigour of modern trials, but they are persuasive. In May 1747, while working as a naval surgeon at sea on HMS Salisbury, Lind isolated six pairs of scurvyed seamen and gave to each pair a remedy that various medical authorities had canvassed. Five pairs of the seamen were prescribed vinegar, mustard and garlic purges, elixir of vitriol, and other potential remedies. These seamen remained scurvyed. For the remaining pair, Lind prescribed oranges and lemons. The pair quickly recovered. Citrus fruits were the convincing winners in the trial. Lind included a report of his experiments in his *Treatise of the Scurvy*, which was published in Edinburgh in 1753. Thus he raised his decisive monument on the route to our understanding of the disease that regularly disabled ships’ crews in the age of Britain’s maritime expansion.

Lind’s monumental *Treatise*, however, is a rather mysterious text. If its conclusions about the efficacy of oranges and lemons were as persuasive as my summary of the standard account makes them look, why did the Admiralty, which had a powerful reason for wanting a cure for scurvy, wait for another 42 years before issuing seamen with regular doses of lemon juice? Conservatism or niggardliness are not good explanations. A reliable cure for scurvy would have doubled the overall efficiency of the fleet: no admiral is likely to have turned away the chances of an improvement on that scale. And again, if Lind’s conclusions were persuasive, surely his own clinical practice would have been transformed by them: we might confidently expect him, when he became the director of the Navy’s largest hospital, Haslar, to have routinely dosed the thousands of scurvyed seamen who came ashore with exactly the remedy that had been efficacious in his Salisbury experiments. But he did not. Oranges and lemons certainly became part of his repertoir of treatments, but they did not take automatic pride of place, rendering every other measure obsolete.

The mystery that clings to Lind’s *Treatise* is the consequence of our knowing about vitamin C. Knowing, beyond all doubt, that scurvy is a disease of vitamin deficiency and that it responds quickly to remedies based on fruit and vegetables that contain vitamin C, we assume that Lind, who knew nothing of vitamins (he had been dead a hundred years before they were discovered) was none the less trying to establish that there is a constituent in vegetables and fruit―especially citrus fruits―that is uniquely efficacious in curing scurvy. Our assumption is mistaken. Lind did not conceive of scurvy as fundamentally a digestive disorder at all. He believed that it was a disease of faulty digestion. Once his theories of how the body works, and of what goes wrong when it is assailed by scurvy, are grasped, his experiments on the Salisbury’s seamen have to be reinterpreted. This is not to mean Lind what they inescapably mean for us, and the rather insignificant place that he gave them in his *Treatise* indicates that he did not see them as the compelling conclusion to his research into scurvy. The Admiralty, along with plenty of naval doctors and the redoubtable Captain Cook were not being obtuse when they overlooked the potential significance of Lind’s experiments: Lind overlooked it himself.

The clearest section of the *Treatise* is the chapter in which he sets out what he calls his own “theory of the disease” (chapter VI). Scurvy is, he says, essentially a disease of faulty digestion and excretion. The digestive system, according to Lind, operates optimally when people live in generally warm and dry conditions, and eat a reasonably varied diet. Under such conditions, he asserts, the digestive system breaks down food into the small particles necessary for the renovation of the body, and, eventually, for excretion. The mode of excretion is important. Lind was impressed by the work of the Paduan physician, Santorius, who had calculated that over half of the body’s waste products are evacuated by what
Lind calls “insensible perspiration” through the pores of the skin. According to this theory, if food is imperfectly digested, and if, as a consequence, its waste products cannot be insensibly perspired, it will putrefy the body. In Lind’s words, because insensible perspiration is:

“...the last and most elaborated action of animal digestion, the body is hereby freed from what is consequently the most subtle [sic] and putrescent of the animal humours. And it is certain these excrementitious humours naturally destined for this evacuation, when retained long in the body, are capable of acquiring the most poisonous and noxious qualities, and a very high degree of putrefaction” (first edition, p 203).

Lind goes on to apply this theory to outbreaks of scurvy at sea. On long voyages, and especially when the weather is wet and close, the digestive system of an otherwise perfectly healthy seaman is hard pressed to cope with the normally perfectly adequate diet of unleavened bread and heavily salted meat. The stomach cannot break the sea diet down into small, digestible particles. At the same time, the pores of the skin are tending to close up in response to the poor weather, thus further jeopardising healthy excretion-by-perspiration. The symptoms of scurvy then appear—stinking breath, bleeding gums, ulcers on the skin. The imperfectly digested, unexcreted food is starting to putrefy the body.

According to Lind, therapy should be designed to reverse the environmental conditions that produced the disorder. Sufferers need to be given fresh air, dry conditions, and exercise. There is nothing wrong, he says, with the seaman’s regular diet:

“...it appears, I think, very plainly, that such hard dry food as a ship’s provisions, or the sea-diet, is extremely wholesome [sic]; and that no better nourishment could be well contrived for labouring people, or any person in perfect health, using proper exercise in a dry pure air; and that, in such circumstances, seamen will live upon it for several years without inconvenience” (p 92).

What part, then, do oranges and lemons play in the relief of scurvy? As a practising naval surgeon, Lind knew that it was simply unrealistic to recommend that scurvyed members of a crew should be transferred to warm, dry lodgings. There were obviously no such places on a crowded warship on a long voyage. What could be recommended, however, were medicines designed to restore the digestive system to its optimal condition, and much of Lind’s book is given over to a discussion of the preparations that are likely to do this. This is where oranges and lemons come in. He was not original in proposing that citrus fruits in particular, and greenstuff in general, are likely to be useful. He was perfectly ready to acknowledge long before and further behind and launching into all sorts of other recommendations, many of which are environmental rather than dietary in nature. He was perfectly ready to acknowledge long before and further behind and launching into all sorts of other recommendations, many of which are environmental rather than dietary in nature. He was perfectly ready to acknowledge long before and further behind and launching into all sorts of other recommendations, many of which are environmental rather than dietary in nature. He was perfectly ready to acknowledge long before and further behind and launching into all sorts of other recommendations, many of which are environmental rather than dietary in nature. He was perfectly ready to acknowledge long before and further behind and launching into all sorts of other recommendations, many of which are environmental rather than dietary in nature.
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