

# 1753

## LIND, LEMONS AND LIMEYS

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**I**N 1753, just 200 years ago, Samuel Johnson was busy with his dictionary, George Washington obtained his first military commission, and a short book appeared which, in its way, was to revolutionize the world. Much of future history was to involve exploration, maritime trade, and colonial expansion. These developments could occur in part only because "the great sea plague" was finally conquered. And this nautical scourge—scurvy—was overcome largely through a brilliant model clinical experiment by a Scotsman serving as a surgeon in the Royal Navy.

It is difficult for us in these halcyon days of ascorbic acid to appreciate the problem faced each winter by the scurvy-ridden population of Europe in the pre-Lind era, the perplexity of Hippocrates confronted by large numbers of soldiers suffering from pains in the legs and gangrene of the gums, or the remarks of de Joinville regarding a 13th-century crusade in which barber surgeons had to "cut away the dead flesh from the gums to enable the people to masticate their food."<sup>1</sup>

Several monographs on what we now assume was scurvy appeared soon after the printing press became active, and, in fact, in 1645 the Faculty of Medicine at Copenhagen published a summary of their knowledge of this prevalent syndrome. The earlier settlers in Hudson Bay were forced to discontinue their colonization of the region because of scurvy, while in 1703, during a siege of the town of Thorn in Prussia, an epidemic of scurvy killed 5000 of the garrison and many civilians.

In many places on the globe, in Russia, India, Africa, and the United States, epidemics occurred among troops, in prisons, asylums,

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and homes for the indigent. The year 1753 did not bring an end to all this, for in the War Between the States, over 100 years later: "Among the white troops during the five and one-sixth years covered by the statistics, 30,714 cases of scurvy were reported; and 383 deaths were attributed directly to that disease." In the Franco-Prussian War (1870–71) scurvy was prevalent in the besieged city of Paris. In the Russo-Japanese War, half the garrison of 17,000 men at Port Arthur had scurvy. As recently as World War I a unit of 100 beds per division in the Russian Army was set aside for scurvy, while 11,000 cases were reported from the Indian troops in six months in 1916. (It should be noted that only 20 cases of scurvy were reported among all American troops in 1917 and 1918.)

Let us jump back to 1496, when Vasco da Gama's ships sailed to India. The Portuguese poet Camoens wrote:<sup>2</sup>

A dread disease its rankling horrors shed  
And death's dire ravage through mine army  
spread,

Never mine eyes such dreary sight beheld,  
Ghastly the mouths and gums enormous  
swelled

And instant, putrid like a dead man's wound,  
Poisoned with fetid streams the air around.  
No sage physician's ever watchful zeal,  
No skilful surgeon's gentle hand to heal  
Was found, each dreary mournful hour we  
gave

Some brave companion to a foreign grave.

This killer is said to have claimed almost all of Magellan's crew, and when Anson sailed around the world in 1740–44 nearly two-thirds of his crew of men died of scurvy. A naval surgeon in the Napoleonic Wars wrote: "it is the opinion of some of the most experienced officers that the blockade system of warfare

which annihilated the naval power of France could not have been carried on unless sea scurvy had been subdued."

Was, then, this book, whose two-hundredth anniversary we celebrate this year, the first that explained how scurvy could be controlled? It is a commentary on man's reception of new ideas that over 100 years before (1636) the first naval surgeon, John Woodall, wrote:<sup>3</sup>

"The juyce of lemmons is a precious medicine and well tried; being sound and good let it have the chief place, for it will deserve it, the use whereof is: It is to be taken each morning two or three spoonfulls, and fast after it two hours. Some chirurgions also give of this juyce daily to the men in health as a preservative."

And Shakespeare's son-in-law, Dr. John Hall, cured scurvy by brewing a beer or ale of "ascorbic herbs, viz.: scurvy grass, watercresses and brook lime."

What, then, is the significance of 1753? In that year appeared "A Treatise of the Scurvy in three parts. Containing An inquiry into the Nature, Causes, and Cure, of that Disease. Together with a A Critical and Chronological View of what has been published on the subject" by James Lind, M.D., Fellow of the Royal College of Physicians in Edinburgh.<sup>4</sup>

James Lind, a pioneer in clinical nutrition experimentation, was born in 1716 and died 78 years later, the respected head of the Royal Naval Hospital at Haslar. Although he deserves full honor for his recommendations on personal cleanliness, hygiene, and sanitation, which really began the science of naval medicine, and for his studies of tropical preventive medicine, he is best known for his report of a simple experiment on board the H.M.S. *Salisbury* in 1747.

Lind selected 12 scorbutic sailors from the many on board. These men were as alike as possible in regard to symptoms and physical condition. He then tested simultaneously the various therapies in common use at that time. Six groups of two men each were formed. In addition to the usual rations, one group received a quart of cider a day, another 25 drops of an elixir of dilute sulfuric acid three times a day and a mouth wash of this preparation.

Similarly, other groups received vinegar, sea water, and a pill containing garlic, radish, mustard seed, and the like. One group of two men had a lemon and two oranges daily.

Within a week these last two recovered to such an extent that one man returned to duty, while the other acted as nurse for the other ten, whose condition scarcely changed.

This study was well planned and concise, and even according to modern advanced ideas on scientific research, it was a well-controlled experiment. Lind's clear statements of his careful observations leave no question as to the importance of the findings.

Here, then, was a clinical experiment which should have established beyond doubt the efficacy of lemons and oranges in the treatment and prevention of scurvy. This is doubly to be expected because Lind's work was "proof" of what had been known for some time, in some quarters at least. For there are letters from early New England settlers, one hundred years before Lind, stating that lemon juice speeded the recovery of scorbutics, and Scott<sup>5</sup> mentions that a Dutch physician, Ronssens, wrote in 1564 that "Dutch sailors who, returning from Spain, were attracted by the novel richness of the fruit (oranges) and by their greed and gluttony unexpectedly drove out the disease (scurvy) and had this happy experience not on a single occasion only, but repeatedly."

However, it took fifty years and other naval surgeons to make this knowledge of practical value. Like other bureaucracies, the Admiralty was not receptive to change. In 1793, Dr. John Harness, a surgeon to the Mediterranean Fleet, was able to get the Admiral, Lord Hood, to order lemon juice to be supplied to all ships, with a consequent rapid decrease in the incidence of scurvy. This event, plus the fact that he was acquainted with the work of Lind, led Sir Gilbert Blane, a physician and administrator, to convince the First Lord of the Admiralty, Lord Spencer, to make lemon and other citrus fruit juices a requirement for all vessels of the Royal Navy. This was in 1795. Two years later, Lord Spencer found not one case of scurvy at the Royal Naval Hospital, whereas previously



there were always numerous cases to be found. (It is also of interest that Blane recognized that heating lemon juice reduced its antiscorbutic property, while adding a little sugar or spirits helped retain it.)

This story could not end without an ironic twist. Dr. James Lind died in 1794, a year before lemon juice was officially approved by the Admiralty.

In spite of the demonstration by Lind and others during various expeditions of the antiscorbutic property of lemon juice, it took a generation for official naval action. It took even longer for the merchant marine. And for many years after scurvy had been eradicated from the navy, it still appeared among the crews of commercial ships sailing to India, Ceylon, and China.

Even then, British sailors were not forever freed from the danger of scurvy. In 1850, political pressure forced the British Navy to stop using Mediterranean lemons as antiscorbutics and switch to Jamaican limes. These, unfortunately, contained little or no ascorbic acid. The use of limes led to the name "limey" as a synonym for the British sailor. It also led to disaster for the men of the Nares expedition to the North Pole, where,

despite their consumption of large amounts of lime juice, many of the explorers died of scurvy. Because of this debacle, physicians, explorers, and sailors distrusted the value of citrus fruits as antiscorbutics, and there was a temporary return to the belief that scurvy was due to constipation and auto-intoxication.

Gradually, however, even the merchant marine realized the power in the lowly lemon, and ultimately, as we all know, scurvy was to all intents and purposes eliminated as a disease of mankind.

If there is a moral in this example of the slow recognition of a scientific achievement, there is also the corollary moral that good clinical experimentation requires simple tools, a clear head, and a courageous heart.

#### REFERENCES

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