

Captain James Cook, Scurvy, and the Use and Misuse of Herbs

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ABSTRACT: The Age of Exploration unleashed a terrifying manifestation of an ancient scourge, scurvy. This year, the 250th anniversary of Captain James Cook's landing in Botany Bay in the *Endeavour*, prompts a review of Cook's role in the search for a cure. The British Admiralty, under pressure to stem its increasing toll, charged Cook with the task of evaluating and reporting on reputed dietary antiscorbutic treatments during his long voyages into the Pacific. This paper considers the contemporary place of beers and ales, in particular spruce beer, a beverage Cook favoured, and more specifically, the tendency at the time to add herbs to beers to enhance their antiscorbutic properties, and their use and misuse in pursuit of that end. But given total ignorance as to scurvy's cause, the confused approaches inevitably failed to differentiate a true antiscorbutic from long-standing traditional herbal remedies. Cook's spruce beer beautifully illustrates the many subtleties involved in a world where biochemistry as we understand it lay far into the future.

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'To some, scurvy was a toxin that rose up from the sea or fell down out of the atmosphere, seeping into the timbers of the ship then infecting the bodies of the sailors, suffocating, dry-drowning them.'

—Peter Moore, 2018¹

The Age of Exploration unleashed a fearful manifestation of an ancient disease, scurvy. More technologically advanced ships capable of increasingly longer voyages would see scurvy emerge as '[...] one of the earliest occupational diseases'.² By one estimate it accounted for over one million shipboard deaths between the years of 1600-1800.³ As expressed by the historian Kenneth J. Carpenter, scurvy 'is probably the nutritional deficiency disease that has caused the most suffering in recorded history'.⁴

In this year 2020, the 250th anniversary of Captain James Cook's landing in Botany Bay in the *Endeavour*, it is timely to review Cook's role in the saga of scurvy. Some recent scholars have tended to malign Cook in this regard, but care is needed when assessing eighteenth century actions from current perspectives and knowledge. This paper will focus on just one aspect of scurvy on which so much has been written, the place of beers and ales as antiscorbutics in Cook's day including spruce beer, a beverage he favoured. It will examine more specifically the tendency at the time to add herbs, broadly defined, to

beers to enhance their antiscorbutic properties, and their use and misuse in pursuit of that end. To do so requires contextualization of the role of food, drink, and medication in the seventeenth and eighteenth centuries when they were often one and the same.⁵

The incidence of scurvy had been steadily worsening since 1700 with the increasing numbers and durations of maritime voyages. The British Admiralty was under mounting pressure to find a cure. Many prevalent theories such as moist air and poor ventilation as causes had not yet been fully discredited, but attention was increasingly turning to ships' 'victualing'. The Admiralty needed effective antiscorbutics; they should be cheap, stable for at least a year, portable and sparing of water. It was a formidable task to limit choices to those they most favoured from amongst the babble of claims from vested interests and other influential parties seeking their attention. Cook's first voyage in the *Endeavour* and his subsequent two voyages into the Pacific provided opportunities to evaluate and report on several reputed antiscorbutic remedies. While Cook was at pains to accommodate the Admiralty's directions, as a seasoned mariner he had his own views.

Cook, as did some others, knew scurvy could be kept at bay or even cured with a diet of fresh fruits and vegetables and fresh meat. At the time it was inconceivable scurvy stemmed from the lack of a micro-nutrient in these, even more that this was at risk of destruction by the then-usual food-preservation methods. Humoral doctrine, philosophical, not empirical, still dominated medical practice as it had for centuries, and its more senior adherents had the ear of the Admiralty. As put by Sir James Watt, 'This led to a blunderbuss approach to antiscorbutic treatment which confused the issue by failing to differentiate a true antiscorbutic from the remedies of longstanding tradition.'⁶ The isolation of vitamin C was only accomplished in the early twentieth century, and even now its full role in human metabolism is not completely understood.⁷ Spruce beer well-illustrates the many subtleties involved in seeking a cure in a world where biochemistry as we understand it lay far into the future.

Cook was no stranger to the 'pestilence of the sea'. During the Seven Years' War his ship the *Pembroke*, when it reached Halifax in 1758 'had so many sick on board that it took no part in the military action of Wolfe against the French'.⁸ The town itself was much affected by outbreaks of scurvy. Halifax, founded a mere decade previously, like most raw seaports and military towns had a powerful thirst. Supplies of the beverage favoured by the lower classes, beer/ale, were limited because both the war and the harsh climate restricted supplies of grains suitable for brewing. But spruce trees and molasses were both abundant, so locally brewed spruce beer, wherein molasses rather than malt provided the sugars essential to fermentation, soon filled the gap. *The Halifax Gazette* in 1754 carried an advertisement by one Frederick Becker for 'choice spruce beer at five shillings a barrel or two pence a gallon', well below the price of rum offered in the same advertisement. Cook must have been aware of the popularity of spruce beer. Whether he believed it also had antiscorbutic benefits is not known but it seems plausible as sentiments to that effect were widespread.

Some early settlers in northern parts of Canada certainly valued spruce-based drinks. In 1752, one Thomas Pichon wrote from Cape Breton Island that the inhabitants of Port-Toulouse ‘were the first that brewed an excellent sort of antiscorbutic of the tops of the spruce-fir’.⁹ Peter Kalm, the Swedish-Finnish botanist who travelled widely in North America from 1748 to 1751 found the French in Canada largely drank spruce beer ‘which, as they use no malt liquor, is their only drink, except wine brought from France which is pretty dear’.¹⁰ Kalm noted that the botanists referred to the kind of spruce used as black spruce (*Picea mariana*). These brewed spruce-based drinks were likely local adaptations of long-established Baltic beers. Independently, antiscorbutic drinks based on the leaves and bark of certain local trees were known to at least some indigenous New-World cultures. Jacques Cartier some 200 years earlier, when his expedition was trapped in ice in the St Lawrence River, saw his scurvy-afflicted crew dramatically restored to health by use of such a drink. Nevertheless, while sometimes described as a beer or even spruce beer, the historical account is clear: it was not fermented and more likely an infusion.

In August 1764, in Newfoundland to continue surveying the island’s coast, Cook severely injured his right hand. As a result, ‘[...] the men, employed at ship tasks and ‘brewing of Spruce Essence’ – brewing ‘spruce beer’, that is – grew a little restive, and even the excellent Peter Flower, Cook’s senior hand, was with two others “confin’d to the Deck for Drunkness and Mutiny”’.¹¹

In 1765 he returned, and during an overhaul ‘There was time to brew spruce beer again’, and in the following year he notes similarly ‘Here she was hauled ashore for scrubbing and beer was brewed’.^{12, 13} Independently, in 1766 Joseph Banks, then just 23, joined an expedition to Newfoundland and Labrador. In early spring he noted how ‘the Country is Covered with wood fir is the only Tree which can yet be distinguished of which I observed 3 sorts Black Spruce (*Picea mariana*) of which they Make a liquor Called Spruce Beer’.¹⁴

Settlers in Newfoundland in pursuit of cod had long relied heavily on spruce beer. ‘Before the use of this beer was found at Newfoundland, the men were sickly, scorbutick, &c. but now there is no country where they are more healthy’.¹⁵ Banks considered it a very common liquor of the country along with the popular ‘chowder’ and included his ‘receipt’ as ‘Perfectly as I can get it’:

Take a copper that Contains 12 Gallons fill it as full of the Boughs of Black Spruce as it will hold Pressing them down pretty tight Fill it up with Water Boil it till the Rind will strip of the Spruce Boughs which will waste it about one third take them out & add to the water one Gallon of Melasses Let the whole Boil till the Melasses are all dissolved take half a hogshead & put in nineteen Gallons of water & fill it up with Drink from this Liquor in itself Very weak are made three Kinds of Flip Cald here Callibogus, Egg Calli and King Calli the first.^{16,17}

In Cook's time England enjoyed two broad styles of 'spruce beer'. The older was a black beer commonly associated with Danzig, the main port of Prussia, a country called 'Sprowse' by Chaucer.¹⁸ The popular 'Sprossenbier' (shoots beer), inevitably translated into English as 'spruce beer', was defined as a healthy beer made of the shoots of white spruce (now *Picea glauca*) and useful for scurvy.¹⁹ Krünitz in his encyclopedia (1787) calls Braunschweiger Mumme the king of the German beers, shipped to England and Holland and even to East India.²⁰ By 1719 a London alehouse was selling 'Right Brunswick Mum, and Spruce-Beer, Wholesale and Retail'.²¹ Meanwhile, the North American style described earlier, already highly popular throughout the New World, was a growing import into London. Its availability derived from the invention in North America of 'essence of spruce'.

Sea Scurvy and Land Scurvy

While the Admiralty's concern was scurvy as a seagoing malady, the disease had been known for centuries if not millennia. Maynwaringe in 1679 noted 'The Scurvy is properly said to be endemical in most of our Northern Countries, that border upon the Baltic Sea, or adjacent to the German Ocean: As Denmark, Swedland, Norway, Ffrisland, Holland, England etc...'.²² Whether a series of particularly harsh winters and late springs may have increased the incidence of scurvy in England and Wales as the seventeenth century progressed - a period coinciding with the depths of the Little Ice Age - 'or merely indicated a greater awareness of its presence, is not known'.²³ By 1685 Thomas Tryon noted the condition was 'of late Years become an Epidemical or almost general Disease amongst English people'.²⁴

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It was generally believed 'sea scurvy' and 'land scurvy' were two different conditions until well into the eighteenth century. At the time humoral theory saw ill health as an imbalance in one or more of the four humours; in the case of scurvy the affected organ was the spleen. Correcting dietary treatments for the two conditions were distinct: 'For "hot," "alkaline," "sea" scurvy, cooling acidic foods such as oranges and lemons were advocated; "cold", "acid", "land" scurvy, in contrast, could be treated by the "hot" antiscorbutic plants such as scurvy grass, brooklime, and the cresses'.²⁵ Such herbs featured widely in contemporary medical texts and herbals. Carpenter refers to at least nine Dutch or German physicians between 1560 and 1600 who described the curative value of scurvy grass (*Cochlearia officinalis*) and watercress (*Nasturtium officinale*), or 'infusions of them'²⁶. One of the earliest English references in a herbal of 1568 added a third herb, brooklime (*Veronica beccabunga*).²⁷ In England in 1596 William Clowes published a manual of advice for both military and sea surgeons which described treating two sailors recovering from 'scorby'. Along with other practices of the day, he also included '[...]as their standard drink [...] new ale which had had scurvy grass, newly picked and bruised in a stone mortar, steeped in it for two days together with cinnamon and ginger'.²⁸ While guided by humoral practices, pragmatism ruled, and if appropriate he, like others were increasingly prepared to employ long-standing empirical remedies.

With the dietary deprivations of long winters, particularly in more northern regions, ‘Spring purges, scurvy ales and diet drinks were all part of a normal, albeit seasonal diet.’²⁹ Few had access to professional physicians, so diagnosis and prescription were largely in the hands of lay practitioners such as apothecaries and surgeons, often women. Weyer, in *A profitable Treatise of the Scorbie*, referred to the ‘familiarily knowne’ infusions of ‘noble matrons’³⁰. Herbals and household recipes whether oral or written, were relatively similar, typically calling for large quantities of the favoured three herbs, sometimes augmented with others such as fumitory and dock root. These common herbs were crushed or pressed, then infused into beer/ale for some days (occasionally into wine or milk), then one or more doses (draughts) a day were administered for perhaps several weeks. The quantities, lengthy infusion times and prolonged treatment arguably combined to confer some antiscorbutic effect. While none of these herbs are particularly high in Vitamin C (their contents ranged from 40 to 100 mg/100 grams, comparable to its concentration in fresh orange or lemon juice), typical recipes such as those in the Appendix and administered as specified, should have at least served as preventatives. These antiscorbutic herbs retained an important role across the sixteenth, seventeenth and eighteenth centuries.³¹ Scurvy ales, in short the ‘cure’, taken along with regular meals, was appreciated even if their preventative values were uncertain.

The Problem with Beer

Beer/ale and cider, the essential beverages of the British lower classes, were considered safer than water and milk, and widely believed to have medicinal value.³² The weaker ‘small’ beer was also the standard drink for seamen, their ration a gallon a day; for them it was a food, a welcome respite and part of a healthy sea diet. Nathaniel Hulme, in his *A Proposal for Preventing Scurvy in the British Navy* published in 1768, called beer ‘a noble drink for seamen’ and noted that ‘ships [...] have been observed to fall into the scurvy much sooner, after this wholesome liquor was expended, than while it was continued to be drunk’.³³ As this small beer had poor keeping qualities and occupied more space than spirits, with just a month’s supply taken on board, Cook soon had to begin substituting it with other fermented liquors. Another approach was to brew beer while at sea. To that end the Admiralty specified two types of ‘inspissated juice’ to allow beer to be made on Cook’s later voyages—but given the way they were prepared it is doubtful they or the beer made from them had any antiscorbutic values. Perhaps increasingly convinced this was indeed the case, and encouraged by long-established claims for its medicinal values, as will be seen, Cook made his favoured spruce beer wherever spruce or fir or their analogues were available.³⁴

The reputation of sprossenbiers added to popular belief in the health benefits of beers more generally. Johann Lange in Hamburg in 1684 notes the health effects of the fir against scurvy and speaks of Danish and Swedish references to it as the ‘Scharbocks-baum’ (scurvy tree). Künitz in his 1787 Encyclopedia describes one recipe for Braunschweiger Mumme:

brewed initially from wheat malt and small beans and left to ferment, then the inner bark of fir, birch or fir shoots were added. Another group of herbs and seeds were added, perhaps as flavourings, after the beer had fermented for a while.

Although fermented liquors and some fermented foods were long believed to have anti-scorbutic values, Nathaniel Hulme called for caution in his treatise of 1768, highlighting the limitations of beer at this time. In his proposal to the Navy he cites the extensive empirical experience in favour of infusions of herbs into the daily ration of beer or any other liquor. He reasoned ‘[...] for if a handful of scurvy grass eaten three times a day, will cure the scurvy, so in like manner will its juice if pressed out and drunk. Likewise, the juice of oranges or lemons’.³⁵ He adds ‘Good sound small beer, [although] an excellent antiscorbutick liquor [...] is not found sufficient of itself to prevent the disease’ so should be daily impregnated with ‘[...] the juice and sugar (lemon or orange or fresh greens)’.³⁶

Sensible to the dilemma of supplies of beer and the fresh herbs and/or their ‘juices’ to infuse on long voyages, he too turned to ‘The antiscorbutick power of the fir’.³⁷ He even gave Banks his recipe for making spruce beer with molasses and leaves or wood shavings from the spruce or fir, plus variants using other conifers. James Lind, in his celebrated treatise published in 1753, held that infusions of pines and firs were effective antiscorbutics, but when fermented into spruce beer, were even more so.³⁸ This stemmed from the contemporary belief

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that scurvy was a symptom of putrefaction (decay of various organs of the body), and that fermentation inhibited this. As noted earlier, Cook likely attributed such benefits to his favourite, spruce beer, even though, as some have suggested, more than two centuries later, he had ‘probably had not heard of Jacques Cartier [...] or the Indian remedy’.³⁹ At issue was whether he, or anyone else for that matter, was right. It comes down mainly to fermentation.

Figure 1, prepared by the biochemist Hughes, shows the destruction of vitamin C as the ingredients of spruce beer progress from untreated spruce leaves to stored product.

How is ascorbic acid destroyed during fermentation of beer, as Hughes illustrates? Ascorbic acid is the most fragile (labile) of the vitamins. It is also an antioxidant (in other words, a reducing agent), destroyed by the oxidants with which it reacts. These

	Vitamin C content (mg/100g)
Untreated spruce leaves*	55
Aqueous infusion	14
After fermentation	<0.5
After storage for 14 days	0

FIGURE 1. Changes in Vitamin C concentration during preparation and storage of spruce beer. *There is considerable seasonal variation in the vitamin C content of conifers: the vitamin C content of *Pinus sylvestris* needles is 65 mg/100g in late October, increasing to 120 in early spring. The spruce leaves used in the fermentation experiment were gathered during late November.⁴⁰

include atmospheric oxygen, abetted by certain enzymes (oxidases) often encountered in fermentation. With the benefit of knowledge gained over the last century we now know that metals, particularly copper, can greatly speed up (catalyse) oxidation reactions, as can light and heat. Conversely, where no oxidants are present, then boiling, fermentation and storage will be less damaging to ascorbic acid. A quick boiling to drive oxygen from the liquid can have a positive impact even as prolonged boiling can be destructive, and it also helps if there are other powerful antioxidants present, notably the class of compounds termed flavonoids, common in most fresh fruits and vegetables.⁴⁰ Therefore, if a concoction is boiled in a copper vessel open to the air in broad daylight or fermented without excluding air, any ascorbic acid originally present will soon be lost.

As is well known, by scrupulously collecting fresh greens and other fruit, and meat and insisting his crew partook of these, Captain Cook kept scurvy largely at bay in all his voyages into the Pacific. It was on his second south-seas voyage, on the *Resolution*, that he encountered circumstances prompting him to recall the alleged antiscorbutic properties of his old favourite, spruce beer. Arriving at Dusky Sound in New Zealand on March 27th 1772 after 117 days without landfall, perhaps because his sailors were showing more signs of scurvy than he was ready to acknowledge, he spent the next six weeks taking every opportunity to secure fresh foods: greens and fish, even seals. The conifers of Dusky Sound, although entirely unrelated to north American firs, being members of southern-hemisphere families: rimu (*Dacrydium cupressinum*) and miro (*Prumnopitys ferruginea*), sufficiently resembled them to prompt Cook to use them to brew spruce beer according to his favourite recipe.⁴¹

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Andreas Sparrman, a Swedish naturalist who joined the *Resolution* at Table Bay, agreed with others, finding the resulting beverage 'refreshing to our tired bodies tainted with scurvy'. After a small amount of rum or arrack has been added, with some brown sugar it was apparently referred to as kallebogas, after a similar mixture in North America, a reference which takes us back to Banks' time in Newfoundland.⁴² But while no doubt refreshing, any antiscorbutic benefits apparent from the ship's extended layup in Dusky Sound could not have derived from the 'spruce' beer prepared to his recipe.⁴³ Ironically, had local plants, including an abundant herb Cook referred to as lambs quarters (probably the widespread *Tetragonia tetragonoides*, now commonly referred to as New Zealand Spinach), been added as fresh infusions to the finished beer, it may well have proved beneficial.

Conclusion

Beers and ales, including spruce beer, for centuries were held to have antiscorbutic properties. But as this paper sets out, the addition of herbs was not sufficient to convey these, whatever the appeal of the beers themselves. The herbs' content of vitamin C soon succumbed to prolonged boiling, particularly in the favoured copper kettles and cauldrons of Cook's times, and to fermentation, particularly in open vessels. The struggle against scurvy at sea in

particular spanned centuries, even as long-standing traditional remedies consistently pointed to the value of herbal infusions, which involved treating their vitamin C content far more gently. In many ways Cook obtained his benign results throughout his three long voyages in spite of the conventional ‘scientific’ wisdom, by exercising the courage of his convictions borne of his own experiences, yet still remaining on the best of terms with his superiors.

History reminds us that long ocean-going voyages were known to many other cultural groups including Incas, Polynesians and Chinese, who like the North American Indians did not have the benefits of modern nutrition science. As argued by the anthropologist Levi-Strauss, ‘primitive’ cultures were masters of the ‘logic of the concrete’. Knowledge was derived from sense perception, which ensured balanced diets in the harshest conditions. Their understanding was gained through trial and error over time immemorial. ‘By undertaking extended sea voyages, westerners ventured out into an unknown biotope to which they needed to adapt.’⁴⁴ Time, technology and science—and the potato—were eventually successful.

Acknowledgements

I wish to acknowledge the inspiration from an earlier paper by Dr Andrea Cast.

Appendix

The Countess of Arundel’s drink for the Scurvy

208	12 little handfuls	fumitory (<i>Fumaria officinalis</i>)
	12 little handfuls	scurvy grass (Spoonwort, <i>Cochlearia officinalis</i>)
	3 little handfuls	brooklime (<i>Veronica beccabunga</i>)
	6 little handfuls	watercress (<i>Rorippa nasturtium-acquaticum</i>)
	3 gallons	strong beer or ale

Clean and stamp the herbs. Put them in a bag and hang them in the ale until it is stale (about a week) Remember to close up the container of ale.

‘Drink a good draught in the morning [about a pint], fasting an hour after, another an hour before dinner, and another half an hour before you go to bed [...] Use it three weeks or a month together.’⁴⁵

Source: *The Queen’s Closet Opened: Incomparable Secrets in Physik, Chirurgery, Preserving, Candyng, and Cookery; as They Were Presented to the Queen* (London: 1656), pp. 169-70

From the Countess of Kent: A Medicine very good for the Dropsie, or the Scurvy and to clear the blood.

Take four gallons of Ale, drawn from the tap into an earthen Stand, when the Ale is two dayes old, then you must put in of Brook-lime, of Water-cresses, of Water-mints with red stalkes, of each four handfuls, half a peck of Scurvy grasse, let all these be clean picked, and

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washed, and dried with a cloth, and shred with a knife, and then put into a bag, then put in the Ale, and stop it close, so that it have no vent, stop it with Pie paste; the best Scurvy grasse groweth by the water side; it must be seven days after the things be in before you drink it.

Take two quarts of water, and put in four ounces of *Guaicum*, two ounces of Sarsaparilla, one ounce of Saxifrage, put it in to a Pipkin, and infuse it upon the embers for twelve houres, and then strain it, and put it into the Ale as soon as it hath done working, this being added makes the more (?).⁴⁶

Source: *A Choice Manual of Rare and Select Secrets in Physick and Chyrurgery: Collected and Practised by the Right Honourable, the Countesse of Kent*, W.I., Gent., ed. (London 1653), p. 30.

Notes

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