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James Lind: Laudatory Address

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I must thank the University of Edinburgh for allowing me the honour of giving an oration in praise of Physician to the Fleet, Dr James Lind. In some ways, being myself a ship's doctor, I may be able to appreciate better than others Lind's remarkable genius as an all-round doctor and preserver of the health of the healthy. Lind's versatility is evident in his three great classics on scurvy, hygiene, and tropical medicine, in each of which subjects he was a pioneer and an original investigator. Lind indeed has claims to be the founder of vitamin therapy, social medicine, and tropical climatology. It is noticeable however that his popular soubriquet, 'the father of nautical medicine' implies a practical knowledge of the three above-mentioned more restricted specialisms.

In the present century, as specialization has become narrower and narrower, versatility in a medical man is not looked on with much favour by the younger generation of hospital specialists who have seldom done a period of probation in general medicine and surgery and never done a course in preventive medicine. Indeed, many specialists are so highly differentiated that they cannot see their own special tree of knowledge for its branches and leaves. Some even seem to take a pride in knowing nothing of what goes on outside their own myopic range of specialized vision.

There are, however, many situations where such a restricted field of view is impossible, as in ships, small islands, primitive countries and sparsely populated areas where a complete battery of specialists could not find enough work, even if they were subsidized by the State. The policy of full-time specialization, without a probationary period of more general experience or versatility, is at last causing some anxiety among the thinkers and educationalists in the medical profession. It is, moreover, debatable as to whether we get the best practical medicine and surgery by this policy of narrow specialization. Only last January, Sir Frederick Bartlett (1953), in an address on *Thinking in Medicine*, asserted that 'all great doctors have been men of wide and varied interests'. He goes on: 'the process of bringing together fields or items of knowledge and observation which have hitherto been unrelated is almost always the first step of discovery, especially in biology'. Medicine is of course biology. Lind's disciple, Thomas Trotter, had christened him 'the man of observation' as well as the father of nautical medicine. Well, therefore, does the versatile and observant Lind demonstrate the truth of Bartlett's assertion that a wide range of interests is the road to discovery.

It is impossible to read Lind's works without being struck by his powers of accurate observation which at times savours of inspired intuition. I will only briefly

mention two examples. First, more than any other pre-Mansonian physician, Lind associated tropical fever with stinging insects, flies and mosquitoes and in his book on tropical medicine he mentions their absence as one of the four most important factors in the selection of a healthy human habitation. In preparing a site for a dwelling place, he recommends what are unwittingly anti-mosquito measures, i.e. choosing high dry ground, cutting back the scrub around human habitations, and efficient drainage. Similarly he associated typhus, or gaol fever, with vermin in the infested clothes of the press-gang's victims, and his recommendations for the prevention of typhus could be a paraphrase of the delousing instructions to be found in any modern manual of military hygiene, before the discovery of D.D.T. Lind of course had no idea of lice or mosquitoes as the direct agents of fever but his unique powers of observation had taught him, consciously or unconsciously, the almost invariable association between the prevalence of these insects and the occurrence of typhus and tropical fevers.

Lind's genius banished from the navy the two most merciless killers of seamen, scurvy and typhus. As a result I myself am unable to add anything to Lind's clinical observations because, thanks to him, in the 40 years I followed Lind's vocation of preserving the health of sailors I never saw a seaman suffering from scurvy or typhus. I would, however, like to draw attention to some aspects of great academic and practical interest which result from Lind's conquest of scurvy. First, when the application of Lind's recommendations by Blane and Rodney suddenly killed naval scurvy in 1795, ironically the year after Lind's death in 1794, intelligent naval senior executive officers asserted that this event was the equivalent of doubling the fighting force of the navy; because previously, owing to the ravages of scurvy, the sea-going fleets had to be relieved every 10 weeks by a freshly manned fleet of equal strength, so that the scurvy-stricken ships could return to their bases to rehabilitate their ship's companies. At this time the importance of retaining the command of the seas was paramount to England's survival, and Lind was able to double the fighting force of the Royal Navy without adding a penny to the naval estimates or a man to the total strength. It is therefore no idle fancy to assert that Lind as much as Nelson broke the power of Napoleon.

Next, Lind's famous clinical experiment on scurvy whereby he proved that patients on lemon juice were cured of scurvy whereas other patients treated without lemon juice at the same time and place failed to get well is perhaps the first properly controlled clinical therapeutic trial on record. Many medical scientists are prone to talk as if the controlled clinical trial of new drugs or other remedies is a characteristic of modern experimental medicine. Yet this technique was understood by Lind and carried out at sea 200 years ago in H.M.S. *Salisbury*.

There were about this era two other episodes which are by way of being unintentional, but naturally controlled, clinical experiments, that confirmed Lind's deliberate clinical trial. First, when the British fleet was blockading the coasts of France in 1761, the blockading ships were supplied at sea with fresh food and vegetables. By this means Admiral Lord Hawke was able to keep his blockading force continuously at sea at full strength without any trouble from scurvy. The

interesting part about this episode was, not the freedom of Hawke's fleet from scurvy, but the fact that the merchant crews of the supply ships were themselves decimated by scurvy while carrying to the King's ships antiscorbutics which they were not allowed to touch themselves. Here the unfortunate scurvy-stricken merchant sailors acted as a control to the protected Royal Naval ratings. The second incident is to me extremely interesting as a check or control on Captain Cook's antiscorbutic measures. The *Adventure* in charge of Captain Furneaux accompanied Cook in the *Resolution* on his famous second voyage. For some reason they parted company for a time before coming together again in New Zealand. When Cook rejoined the *Adventure* he was furious to find that during his absence twenty cases of scurvy had arisen aboard her, caused by Furneaux's slackness or inability to enforce Cook's compulsory antiscorbutic diet on the ship's company of the *Adventure*. Here, although unintended, was a neatly controlled clinical experiment. As we all know the *Resolution* remained free from scurvy throughout the voyage, but it was the *Adventure's* insubordination, in conditions identical except for the failure to use their protective rations, that proved Cook's antiscorbutic measures to be an effective prophylactic against scurvy.

There is one last point I would like to make on scurvy which is very evident from the study of naval history and Lind's works. Naval experience is strong circumstantial evidence for the belief that only a very small daily dose of ascorbic acid is necessary to maintain perfect health. The naval ration right down to 1914 contained so little accessory food substances, especially ascorbic acid, as judged by modern standards and biochemical analyses, that it is really very hard to understand why there was so little evidence of malnutrition in the Royal Navy. Moreover a study of sick lists of minor ailments in the nineteenth and twentieth centuries produces no evidence whatever for the existence of that mysterious condition, so beloved of temporary medical officers in the world wars which they called sub-clinical scurvy. It is safe now to believe that there was never such a clinical entity as subclinical scurvy, if this diagnosis was supposed to indicate a mild degree of vitamin C deficiency. Similarly, naval experience in the nineteenth century is altogether in favour of the more modern school of biochemists, who believe a maintenance dose of ascorbic acid for a healthy adult is rather below than above 15 mg a day. Anyway, nobody now believes in the colossal doses, up to 300 mg daily, some nutritionists tried to persuade me it was my duty to force on the naval personnel.

Lind's apparent hatred of publicity and self-advertisement has been a subject of much speculation and curiosity. He was perhaps too absorbed and occupied with his great volume of clinical, literary and administrative duties to allow petty bickerings about rank, pay, and status to interfere with his work, even if it meant two centuries would have to pass before medical science was sufficiently advanced to enable his profession to read, understand, and appreciate his supreme scientific genius. Lind appears to have been one of those scientists who whole-heartedly agree with Thomas Huxley's dictum that the only honours worthy to be sought by a scientific man are those bestowed by his colleagues, who are the only people in a position to judge the quality of his work. This contempt of public opinion,

social status, and honours is not so uncommon among real scientists. It is a kind of pride or Greek *ὑβρις*, which is to be deplored in so far as it holds up the development of social science and social health. All scientists, especially in medicine, should be practical sociologists and do their best to bring scientific method and new discoveries in their subjects into practical politics and to aid where possible the preservation of the health of the healthy.

It was well for Lind that he had colleagues like Trotter and Blane who could appreciate his worth and at the same time were not afraid to fight in the open for the welfare of the sailor. Without these loyal colleagues and a succession of wise, sympathetic and exceptionally intelligent admirals in Anson, Hawke and Rodney, Lind's recommendations for a real naval health service, instead of only suffering a time lag of 40 years, might have had to await acceptance for 150 years as they had to do ashore.

Although there is no medical man of Lind's stature who has been so consistently ignored by his own profession, yet he is now at last coming into his own. Lind very obviously from his correspondence had a great affection for Edinburgh and it would have done his heart good to know that his Alma Mater was seeing to it, even after a lapse of two centuries, that he was no longer to remain undiscovered ashore. However, his name was not entirely forgotten in London where you will find it alongside those of Pringle and Sydenham on one of the panels commemorating great medical scientists which adorn the facade of the London School of Hygiene and Tropical Medicine.

Lind, the man of observation, was the first hygienist to note the relative freedom of ships from tropical diseases; and, in his book on tropical medicine, he gives numerous examples of how those who slept in their ships remained free from disease while those ashore seldom escaped fever. He therefore pleaded for the routine use of ships, moored off the coast, as 'health resorts'. This valuable characteristic of ships was well recognized and supported by Lind's successors, who dwelt on the great danger of small boat work when men were sent away overnight up pestilential rivers to cut out slavers, or to fever-stricken settlements to draw water or provisions. Such working parties often became 100% infected with fever while their shipmates who stopped on board remained 100% healthy. This invaluable property of ships was recognized by naval medical officers long before the discoveries of Pasteur, Manson and Ronald Ross. Surgeon Alexander Bryson (1847), for example, says that: 'It should be imperative that no boat should remain absent over-night; were this regulation instituted it would do more to reduce mortality and sickness than all other means of preservation put together'. This principle of using ships themselves as 'Sanitoria' was however, for the Navy, one of the most important of Lind's health recommendations which has never been easy to get across to civil, army, or naval executive authorities, who even in the last war would have nothing to do with this fundamental hygienic principle, till a colossal and quite unnecessary loss of man-power from malarial morbidity made them think again.

The above principle, so emphatically insisted on by Lind, and confirmed by all his successors, depends on the fact that, as we know now, the insect vectors of

disease can seldom travel far or in great numbers across the sea, so that if a ship is moored half a mile off shore and always anchored to windward of any native village, whose inhabitants are the usual reservoirs of malarial and other tropical infections, the ship will remain free from fever. Moreover the habit of ship's companies of passing their excreta directly overboard reduces almost to nothing the probability of their food and water being infected by intestinal parasites. Thus the one simple fool-proof method of preserving the inhabitants of ships from most infectious diseases is to make them sleep and eat on board their ships.

This empirical observation of Lind's was deliberately tested experimentally in the last war. A secret naval base was being constructed on a malarious tropical island. About 50% of the labourers employed on this work, who as usual lived in temporary huts on the beach, were continually sick with malaria. It was decided therefore, when a fresh draft of 400 dockyard men was sent out to reinforce this working party, that they were to occupy an old hulk moored half a mile from the shore. Among the 400 men, who did not leave their floating barracks between dusk and dawn, not one suffered from malaria during their 18 months' residence abroad. Thus Lind's contention that hulks or ships moored off shore were the proper sites for barracks and workshops in unhealthy foreign stations, made 200 years ago, received complete experimental justification in 1943.

Until recent times hospital ships were used in the navy with advantage. Although the use of ships as Lind recommended for hospitals, barracks, and workshops to preserve the health of the naval personnel on foreign stations seems mere common sense, yet there has been a great reaction against the use of ships as hospitals and depots in the present century. This may well be because the ships selected for hospitals have always been old, broken-down, ill-ventilated converted merchantmen, unfit for use as fleet hospitals or anything else. In modern peacetime conditions there is little need for hospital ships, as the Royal Navy can avoid malaria-infested coasts and proceed to organized bases and ports having proper malaria control and sanitation, which are as healthy and free from fever as London or Edinburgh.

In war it was found to be a far different matter when combined operations have to be undertaken off malarious coasts and in fever-stricken jungles, where, as we now know by experience and deliberate experiment, Lind's recommendations to use ships for hospitals and bases can reduce the usual 50% sick list to zero. Under these conditions ships are the only places free from fever and should be indispensable to protect the health of expeditions and conserve their man-power. But the powers that rule the fighting services have never looked favourably on this use of ships, because ships are so urgently required for transport of troops, munitions and supplies of all sorts for the combatant troops that in war their use as hospitals and ambulances is given the lowest priority. For this reason the logisticians, or transport officers of the British and American general staff, were smitten with the idea of using what the army called 'mobile hospital units', and when the naval theatre of operations moved to the vast Pacific Ocean the Americans proceeded to dot down these small hutted hospitals on islands all over the ocean. These so-called 'mobile

hospitals' required two ships, a large working party, and 6 weeks to move them from one desert island to another. But as of course there were no ships, and no available labour corps to move them, there was nothing more static in the Pacific Ocean than a 'mobile hospital'. Therefore most of them rotted, together with their invaluable medical staff, on desert islands thousands of miles from any theatre of operations. The modern Americans are however far more plastic and less hide-bound by tradition than the ancient Britons. They soon saw their error and, as rapidly as possible, replaced their immobile mobile hospitals by the finest fleet of specially designed and air-conditioned hospital ships the world has ever seen. Thus after a time lag of two centuries the United States Navy proved Lind's assertion that ships were the only hospitals possible for military combined operations, in a way that no transport officer would ever dare to argue about in the future.

In conclusion, I will say a few words on a fundamental principle of health preservation which, if not actually enunciated by Lind in so many words, can be read into his recommendations. This observation, or rather inference, which was put forward by Lind for the first time, is that the executive and administrative health authority must be educated in practical health preservation himself and take full responsibility for the public health. Nevertheless to-day the services and civilian executive authorities do not approve this irrefutable health axiom, so that in this matter Lind is more than two centuries ahead of his time. In his book on tropical medicine, he asserted that the ignorance of Commanders-in-Chief on the preservation of health may cause the loss of thousands of lives. Lind thus infers as a corollary that all commanding officers must be educated in practical preventive medicine or, as Zinsser (1935) has put it, never do anything that their Principal Medical Officers do not approve of.

Sir Gilbert Blane (1830) put the matter more emphatically than his master, Lind. In words, that have rarely been heeded by combatant soldiers and sailors, Blane asserted that 'the most sacred and indispensable duties of commanding officers consists in enforcing the means of preserving health: to them more than the medical officers belongs the duty of an unremitting vigilance with regard to all those regulations by which the generation and spread of infection are counteracted'. Blane then went on to point out the ridiculous futility of pretending that a medical officer can do anything to preserve the public health without the full support and sympathetic understanding of the executive authority and that therefore the most important duty of a health officer was to educate his commanding officer in practical hygiene.

Nevertheless, so accustomed has the health officer, ashore and afloat, become to being the mere inferior subordinate of the executive and administration and to acting as a humble adviser, whose opinion is as often as not ignored, that even first-class medical scientists find nothing incongruous in such an absurd and undignified position. Health preservation and the prevention of disease must be directly controlled and practically carried out by responsible authorities who must pass some stiff test to prove they are really competent for the job. It is an anachronism to suggest that a higher civil servant with a first class honours degree in ecclesiastical

history or Greek literature can hope to administer a health service as well as a man of equal intelligence who has a Diploma of Public Health.

Again, the preservation of the health of his troops is without doubt the most important duty of a general or an admiral for conserving the fighting force and morale of his command. The leader of an expedition must himself have a wide academic and practical knowledge of hygiene; it is the most important branch of military science and strategy—much more so than topography, ballistics, navigation, or logistics, which are far easier to leave to his technical specialists than the innumerable health and welfare problems of his army or fleet which arise daily and vary with every kind of climate and circumstance. In other matters than health, this principle of government by demagogues with a confessed disdain for their technical advisers on whom they have to depend for any practical knowledge, may conceivably have some points to be said for it, but in health matters it is completely unsatisfactory. The history of the fighting services proves over and over again Lind's inference, that the executive commanders must be health experts. Indeed the story of the great genius we honour to-day itself proves this basic principle. If Lind had had executive control of naval health matters, would he have waited over 40 years before ordering a compulsory ration of lemon juice? Again, even in 1740, if Lind instead of Anson had led the latter's fateful expedition, would he have suffered the loss of 75% of his men from preventable illness? How many thousands of sailors perished unnecessarily because the executive authorities were too ignorant of the principles of health preservation to enforce some of Lind's recommendations until 40 years had passed?

Zinsser (1935) also has commented on the extraordinary neglect by historians and others of the effects of epidemics and health matters on the course of history and the results of wars. I explained just now how Lind doubled the ships and men at Nelson's disposal, but in Sir Geoffrey Callender's (1924) standard book *The Naval Side of British History* Lind's name does not appear and there is scarcely a reference to the effects of scurvy and other diseases on naval efficiency, morale, or sea power. The same phenomenon is seen in the authoritative biography of twelve famous British admirals entitled *From Howard to Nelson* (Laughton Knox, 1907), and written by seven modern admirals and a post-captain.

Lind's influence is not yet fully worked out. It is to be hoped that this bicentenary will reinvigorate the leaders of our profession till at long last a health officer sits on the Board of Admiralty and the War Council, and till we have a National Health Service entirely administered and controlled by health experts and not by political demagogues or medical men completely ignorant of health preservation. Then we can remember that the long weary journey to this goal was started by Physician to the Fleet Dr James Lind.

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