**English Naval Health under the Tudors: A Student Guide**

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**Part 1: English Naval Health Under the Tudors: A History**

**Introduction.** Institutional history in general has lost favour recently as an academic subject, as the study of the social, economic and political forces that shaped institutions has come to the fore in the post-imperial world (Harding 1995: 1). Harding (1995: vii) points out that despite the amount of recent research, gaps in our understanding of British naval history remain. Harding (1995: 1) posits that the navy as a manifestation of the government was perhaps only second to the Treasury in forming an interface between the state, English society and the rest of the world.

The Tudor period, 1485-1603, coincides neatly with what Bankston (1978: 63) calls the Transitional Period of maritime history, 1492-1600. This period saw the first trans-Atlantic journeys and the beginning of the Age of Sail, when naval health first started to become a major issue relevant to national commerce and security. The struggle to establish naval medicine cannot be viewed in isolation, it is necessary to understand naval history, medical history and how the two are interwoven.

Harding (1995: 2) comments that recent work by both historians and archaeologists has added depth to the understanding of naval history and the historiography of the late 19th and early 20th
century can be better scrutinised. The last major academic work on naval medicine is Keevil (1957), a historical work, since which the post-war perfection of SCUBA (self-contained underwater breathing apparatus) is credited with opening the underwater world to archaeology allowing many sites to be excavated and objects retrieved from the sea-bed. All of the human and animal remains recovered from wreck-sites have been recovered since Keevil (1957) and virtually all medical artefacts that can be directly associated with shipboard use. However, the only two definite English wrecks of Tudor date are the Mary Rose (1545) and the Alderney wreck (probably 1592).

**Tudor medicine.** Medicine in Tudor England faced several issues which impacted on naval medicine:

- The segregation and conflict between physick (internal medicine) and surgery.
- The stratification and hierarchy of the medical profession which meant that many medical men were unwilling to go to sea.
- The control of folk medicine.

Watt’s (1983: 3) summary of the categorisation of the Tudor medical profession is perhaps the clearest. The most prestigious rank were the physicians who held university degrees in physick (internal medicine) and the members of the Fellowship of Surgeons, who were usually university trained and sometimes held dual qualifications in physick and surgery. Ranked below these were barber-surgeons and barbers, drawn from the Barbers Company. The Fellowship of Surgeons and the Barbers Company were united in 1540. The apothecary who made and sold medicinal preparations was ranked below these in the level of recognised medical practitioners and offered free medical advice to those who could not afford the higher level practitioners. However, there also existed a considerable body of uncontrolled folk medicine practitioners with no recognised qualifications. They included travelling quacks, healers, herbalists and “cutters” who specialised in performing one operation. The Tudor period would see repeated attempts to control folk medicine and continual friction between physick and surgery, as the physicians protested about the surgeons encroaching on their discipline while others called for the two disciplines to be united.

**Henry VII (1485-1509).** Harding (1995: 9) suggests that under Henry VII, the first Tudor monarch, the state’s changing needs and how they related to the navy were unclear. Ushering a new royal dynasty into a changing English society after the chaos of the Wars of the Roses,
Henry VII’s maritime activity is probably best described as consolidation. His actions can be interpreted as oriented towards protecting the realm from seaward invasion, developing commerce and combating piracy.

Under Henry VII, as during the medieval period the king’s ships were administered by the Keeper or Clerk of Ships, an official of the king’s chamber, his superior being the Lord High Admiral of England, Ireland and Aquitaine. At this time however, the Lord High Admiral was mainly a judicial authority at court, dealing with maritime disputes. When the navy went to war the admiral delegated his powers to a suitable military leader.

At this time sailors only worked the ships, regular soldiers manned the guns and fought. These regular soldiers were raised by the medieval practice of indentures with whatever noblemen still had large numbers of retainers and up to these noblemen whether they provided a surgeon for their soldiers. As there were few mariners and they did not fight there was no need to add a surgeon’s office to the ancient established offices aboard ship of master, purser, boatswain and carpenter (Keevil 1957: 56-7).

It is not clear whether any barber-surgeons went to sea under Henry VII. While Watt (1983: 5) states that Henry VII may have taken surgeons to sea, there certainly seems to be no written record of them. Keevil (1957: 57) merely claims the low number of barber-surgeons remained adequate during Henry VII’s reign due to his “pacific policy” without mention of barber-surgeons going to sea. Merchant ships were employed only in coastal waters or the Channel, the king’s ships patrolled the narrow seas against pirates or guarded merchant convoys, naval operations were rare, small and little is known about them. Under these circumstances casualties were presumably low and the codified medieval practice of bringing sick or wounded mariners ashore continued (Keevil 1957: 57).

Keevil (1957: 56) describes Henry VII’s navy as “little more than an armed transport service.” To augment its power the navy was forced to commandeer merchant ships and hire or impress foreign fighting vessels that docked in English harbours. There was no presence of a national military need as there had been under Henry V, or any compelling evidence of inadequacy in existing medical provision. There was seemingly no anticipation of the advancement in medical and naval administration that would be made under Henry VIII.
**Henry VIII (1509-1547).** It was under Henry VIII that the English Navy first became a permanent institution, thanks to the changes he made in its organisation and administration. The reign of Henry VIII was punctuated by a series of wars with France between 1511 and 1546. The naval aspect of Anglo-French conflict would rarely involve more than raiding enemy shipping and coasts and the support and protection of land attacks. Early in Henry VIII’s reign the naval service did not offer a profession or a career as there was no continuity of service in royal ships, courtiers could be delegated to naval roles at any time. The fleet continued to be manned in the medieval manner by the king making legal arrangement with territorial noblemen, who recruited and equipped masters and mariners, when this was not enough, men and ships were impressed (Keevil 1957: 58).

Early signs of change came in 1512 when Sir Edward Howard (1477?-1533) went to sea in command of the fleet, the first time that a Lord High Admiral exercised a function that for a long time had become nominal. Sir Edward and his older brother Sir Thomas Howard (1473-1554) would direct naval policy and be responsible for the fleet at sea. The King and the Lord High Admiral had made indentures that agreed “the wages, rewards, dead shares and other dues appertaining to the captains, soldiers, gunners, master mariners and all other folks of our Navy and army now set forth to the Sea.” This included surgeons, the chief surgeon being paid 13 shillings and four pence a month, eight expert surgeons under him ten shillings a month and an unspecified number of other surgeons eight shillings a month (Keevil 1957: 59).

Watt (1983: 5) describes the surgeons listed above as naval surgeons but Keevil (1957: 59) compares the position of the surgeons to those appointed for similar French campaigns in 1415 and 1416, that of military surgeons, not of dedicated naval surgeons. The purpose of the fleet was to transport an armed expedition to Guienne and it seems that any naval action would be secondary to this aim. Therefore, it is not possible to substantiate claims that Henry VIII’s indentures of 1512 mark the beginning of a naval medical service. Throughout the Tudor period whenever noblemen went to war, on land or sea, they upheld the medieval tradition of taking their own surgeons, a practice that even extended to private gentlemen. What Keevil seems to imply is that these surgeons are in office as surgeons of the expeditionary force as a whole, including “captains, soldiers, gunners, master mariners and all other folks,” they are not part of a specific ship’s company. Surgeons that are part of a ship’s company are what can be termed naval surgeons or sea-surgeons.
A more confident candidate for the first recorded naval surgeons is the list in the Exchequer Accounts (56 (10)) 1513 of 32 naval surgeons under four masters (Stirland 2000: 50-1). Watt (1983: 5) states that the selection of naval surgeons was more rigorous than that of army surgeons, naval surgeon selection becoming a special responsibility of the Barber-Surgeons Company.

The ships built by Henry VIII early in his reign produced a total force of 24 ships to carry a total complement of 4650 soldiers, 2888 mariners, statistics which Keevil (1957: 60) believes indicated that ships were still used as transports or fighting platforms for the army. The soldiers were under their own army captains and the seamen under the control of their masters (Keevil 1957: 59-60).

The completion of a new 1000ton flagship, Henry Grace á Dieu in April 1514, marks the start of a change in naval strategy as the first warship. The ship’s maximum complement show she was commissioned as a weapon not as a transport, under one captain were four petty captains, a master, five hundred soldiers and five hundred mariners. On board the Great Harry as the ship became known sailors and soldiers were equal in numbers and importance. Henry VIII realized the significance of gunpowder and during his reign placed heavy artillery below decks firing through gun ports. The introduction of the gun deck altered the construction of ships and shipboard life, evolving warships which were distinct from merchantmen and were no longer ancillary to the army. At this point the navy became separate from the army with the appearance of the warship as a fighting unit. Keevil (1957: 60) states that from this juncture the need for sea-surgeons was accepted as unquestioningly as the need for military surgeons. This makes sense as when the land and sea forces are divorced to each fight in their own theatres then both will need medical provision suitable to that theatre.

Harding (1995: 17) astutely points out that Henry VIII is universally praised for his development of the navy while the foreign policy that made the navy indispensable is seen in a less favourable light. On Henry’s death in 1547 England was waging a war it could not win with Scotland and the peace made with France in 1546 was unstable. Henry had created a situation of financial crisis and inability to raise land forces or allies against France and the navy had become the only means of defence to hand. Having invested in the navy as a symbol of power and to keep the French at bay Henry VIII is described by Harding (1995: 17) as reactive rather than innovative.
Perhaps one of Henry VIII’s most significant actions with regard to naval health and the
delivery of naval medicine was his foundation in 1546 of the Council of the Marine, which going
under various titles would become known in history as the Navy Board. While the king takes the
credit for this it remains unclear who was behind the formation of this council. The seven officers
on the council were each in charge of the administration of a particular branch of the navy and for
the first time gave the English navy a permanent administration (Rodger 1997: 224-5). This new
naval administration was run by men who had proven ability to manage naval concerns,
something that Rodger (1997: 226) notes would become a characteristic of 16th century English
naval administration. Harding (1995: 19) and Rodger (1997: 226) both note that the officers of
the naval administration had considerable links and involvement with the expanding merchant
community. As such they had an active interest in what the navy was capable of doing as it
involved mutual profit for all. The boundaries between royal navy, private merchant, privateer
and pirate became indistinguishable in a relationship that was both mutually exploitive and
mutually supportive (Rodger 1997: 227).

All the recovered human remains of Tudor mariners, around 179 skeletons, were recovered
from the Mary Rose, flagship of Henry VIII’s navy, which sank in 1545 while engaging a French
invasion fleet in the Channel. The Mary Rose has been extensively excavated and was raised in
1982 (Delgado 1997: 264-66; Stirland 2000). The only other remotely comparable remains are all
from 17th century Swedish wrecks, except Seaman Swan, an 80% complete skeleton recovered
from the Swan, which sank off Scotland in 1653. On the Mary Rose two small cabins on the
starboard side of the main gundeck, directly below the deck beams were used by the ship’s master
surgeon and his mate or junior surgeon. This shows the surgeon was close to all action stations.
The works of Clowes (1596: 76-7) tell us that by the Elizabethan period the surgeon’s cabin had
been moved to the cockpit on the orlop deck which was often below the water-line and safer
during combat (Watt 1983: 6).

When the barber-surgeon’s cabin was first entered while the ship was on the seabed, the only
extant furnishing was a simple four-legged bench and a large chest. The chest turned out to be the
most important find of the 1980 season containing many important artefacts. Detailed discussion
important is that the contents and isolated finds from other wrecks match what is known of
surgeon’s equipment from historical sources, syringes, mallets and peppercorns seem to be a
frequent find although their use is debated. Shaving and bleeding equipment also show that the surgeon or his mate were required to fulfil the duties of a barber.

**The Little Tudors (1547-1558).** When the Henrician period came to an end the importance of maritime power remained apparent. As Anglo-Scottish war continued until 1550 the navy was sustained, but when the war ended the navy was not decommissioned and its ships and administration remained in place during peacetime, marking the end of medieval practice and the initiation of the naval condition known as ‘in ordinary’ (Harding 1995: 17-8).

By the mid-point of the century the English Crown had established a naval power whose sophistication and efficiency ranked behind only the Portuguese and Venetians and was dominant in northern waters (Harding 1995: 18, Rodger 1997: 226). As had been Henry VII’s intention English maritime trade had undergone rapid expansion in the first half of the century (Harding 1995: 17). Anglo-French hostilities under Henry VIII stimulated the development of naval strength setting in progress an evolutionary process that would be affected by periodic demands to reduce the cost of the navy and by frantic preparations to ready the navy for defensive action (Harding 1995: 18-9).

At this point there had been only a few long distance voyages made by Englishmen to West Africa, Brazil and North America. Henry VII, anxious to preserve peace and ensure stability after the Wars of the Roses had employed a cautious foreign policy that saw exploration limited to John Cabot’s search for the North-West passage to avoid trespass on Spanish territory. Having rediscovered Newfoundland Cabot never returned from his second voyage, his son Sebastian sailed in 1508 but on his return he found Henry VIII on the throne, who was less supportive of exploration as war with France loomed. Around the midpoint of the century the decline of the European cloth market reduced England’s export and led to new markets being sought, initiating England’s maritime expansion. Sebastian Cabot, Pilot-major of Spain was invited to return and advise the English on finding new markets (Hampden 1970: 13-14). This resulted in the 1553 expedition to find the North-East passage to Asia and China which reached Russia and led to new trade links being formed. This expedition is significant as Cabot produced the first written instructions in Tudor England for health and safety at sea for this voyage. Of the 33 rules the most relevant to naval health are (from Mayers 2005: 162-3):

9. The stewards to keep a close check on the provisions.

15. Maintain cleanliness in the ballast, the cookhouse and elsewhere.
18. The sick are to be cared for and no one to refuse to do the sick man’s duties.

Elizabethan (1558-1603). Harding (1995: 21) notes that the relative peace between 1555 and 1585 allowed the consolidation of the administration set up under Henry VIII, but there is no indication of any progress in naval medicine. However, it could be that more surgeons were going to sea as there was an increase in exploration and privateering. Maritime adventuring was encouraged by the Crown which had a diminished navy and no money with which to rebuild and predations against Spain could be justified on political and religious grounds (Keevil 1957: 64-5).

Keevil (1957: 68) comments that none of the health preserving discoveries from the great voyages were employed when responding to the Armada threat blaming lack of time and money. There is no documentary indication of even so much as a rise in demand for personnel, medical supplies or consultancy from the London Company of Barber-Surgeons. The only indication of improvement is that there were sea-surgeons in regular employment by this time, earning ten shillings a month, the same rate as a seaman.

On March 28th, 1588, the Privy Council had to write to the College of Physicians to request physicians to attend the assembled fleet which was racked with epidemics. Four high profile physicians were named in the letter, of which two were to be selected, which two were selected is not recorded, neither is the advice they gave, but Keevil (1957: 70) suggests there was little they could have done given the level of contemporary knowledge.

It appears to be the case however that there is much that went unrecorded in the Elizabethan chapter in the history of naval medicine. As Keevil (1957: 65) points out, official sources may not reveal much when a lot of naval and military action was organised and carried out by private noblemen and gentlemen. Indeed, 80% of the fleet that met the Armada was comprised of the vessels and crews of private gentlemen which were usually engaged in privateering, trade and exploration. It is remarked that Drake was realistic about medical requirements and in preparing for the 1589 Portugal Voyage he spent £253 on medical provisions and enlisting surgeons and physicians for the fleet (Keevil 1957: 77).

However it is during the Elizabethan period that the first sea-surgeon of note appears, William Clowes (1540-1604), described as the most able of Elizabethan surgeons. Having served with the military and navy he devised a surgical chest for the use of naval and military surgeons and was
the first to write about the practice of medicine at sea, his works citing many cases from his time at sea (Keevil 1957, Zimmerman and Veith 1967).

**Summary.** As Rodger (1997: 327) stresses naval power is built on an infrastructure of long-term steady investment and forward planning. He adds that a naval fleet runs on a complex and delicate machinery that can only be slowly constructed from manifold skills and resources, this he considers a fact that is still not universally accepted. England was a late-comer to the expanding technology of deep-sea navigation pioneered by the Portuguese and Spanish, English seafaring was even behind the Scots and French in Rodger’s (1997: 326) opinion. England’s maritime tradition was limited to coast-hopping and narrow sea navigation. Only under Elizabeth did deep-sea navigation and intercontinental journeys become common with all their inherent health risks.

Much is made of the dangers of going to sea in the 16th century, but many of the dangers encountered were also present on land as disease and famine were rife at the time. Rodger (1997: 316) comments that army and naval commanders accepted that in any year one-third of their strength would be lost on campaign. It is inevitable that in what can be regarded as a developing country any large aggregation of people will eventually experience epidemics. The consequences of epidemics like this are magnified at sea where men are contained in a ship and are unable to disperse until they reach home port.

Given the current state of learning it seems there is little that can be added to the debate other than agreement with Keevil (1957). The early history of naval health and medicine is underpinned by the fragmentary naval history of the period, which as Harding (1995) says has been neglected. Therefore, it seems appropriate to reiterate and comment on the most salient findings of Keevil’s (1957) research, which seem to be:

- Tudor naval medicine was held back by the level of contemporary knowledge and the disorganisation and conflict within English medicine at the time.
- Some of the most pertinent developments were made in private merchant and explorer shipping. “The actions of the royal ships form but a small part of the story of Tudor maritime development, and the origins of naval medicine can more truly be found in the voyages of privateers and merchantmen.”
- The captain or pilot was often the most key figure in relation to shipboard health, it was frequently the case that the surgeon and surgeon’s mate were expected to deal with wound surgery and barber-surgery such as blood-letting, hair-cutting and dentistry.
This came about because the directives and procedures implemented by the captain were often designed to be preventive, while the sea-surgeon was in a curative role to deal with injuries. The *Handbook for Royal Navy Medical Officers* (BR 2193: 0107.3) reinforces this: It is a recognized fact that the doctor is helpless without the cooperation of the Captain. Even today this state of co-operation and the captain’s realization of executive responsibility pertaining to health matters are not fully appreciated. Keevil (1957) gives examples of the healthcare knowledge of Hawkyns and Drake which included familiarity with anti-scorbutics, distilling sea-water and wound management.

The quality of naval surgeons was variable for a variety of reasons. Apprentices were allowed by the Company of Barber-Surgeons to finish their term at sea as a surgeon’s mate, but naval practice meant that a ship’s captain could promote the mate to full surgeon circumventing the assessment required by the Barber-Surgeons’ Hall. This meant promotion to full surgeon without the normal academic requirements (Keevil 1957: 141). Many surgeons were unwilling or reluctant to serve at sea due to the dangers involved and measures introduced in the early Elizabethan to impress surgeons for sea service meant that wholly unsuitable people could be impressed. These wholly unsuitable people included unqualified people who provided very limited medical services, literally “folk medicine.” These people were allowed to practice due to the so-called “quack’s charter” of 1542-3 which was introduced to allow the provision of medical services to the poorest level of society (Keevil 1957: 125, 140-1).

There was never any naval situation that required extensive wound management expertise, what was desperately required was medical intervention that could establish preventive medicine and control the epidemics which were the deciding factors in naval encounters. Indeed, far more mariners died from disease than were ever killed in action. Naval medicine does not figure large in Tudor history despite massive losses from disease at sea and in port which leads to the suggestion that contemporary naval medicine was at such a low level and low scale that it has literally written itself out of history. However, as Keevil (1957: 65) points out above the official picture is not complete, as the following quote makes clear (1957: 83):

“The actions of the royal ships form but a small part of the story of Tudor maritime development, and the origins of naval medicine can more truly be found in the voyages of privateers and merchantmen.”
While the navy had become a permanent institution by the mid-16th century, it accounted for a very small percentage of maritime activity, most of which was in private hands. In common with these private concerns its medical provision was still outsourced from the Company of Barber Surgeons. Naval administration had improved but there was seemingly no administrative body for naval medicine, there is no evidence of a forum for sea-surgeons and transmission of ideas in naval medicine seems limited to the halls of the barber-surgeons companies. As Keevil (1957: 110) remarks, no central body was recording the medical experience gained at sea as most of it was undertaken privately, this would remain the situation until the East India Company was founded in 1600. The East India Company required its surgeons to file reports and collated naval medical experience in order to maximize its own operational potential and profit. The importance of merchant shipping in the development of naval medicine is further illustrated by the fact that the first written instruction on Tudor naval health was created by Sebastian Cabot in 1553 for the Company of Merchant Adventurers (Keevil 1957: 113).

While we have seen the small role of the Crown’s navy in both national defence and naval medicine, the instance in March 1588 when the navy prompted the Privy Council to obtain two physicians shows the worth of having a permanent naval administration to address health issues. Keevil (1957: 70) however, is right in asserting that contemporary medicine was deficient in its understanding of the mechanism and prevention of disease. However, it would seem that the sea-surgeon was becoming more popular during the Elizabethan, setting the foundations of the acceptance that would appear in the early Stuart period.

**Part 2: The scourges of the sea**

**Introduction.** The following five categories of disease are drawn from the *Handbook for RN Medical Officers* and show the five main diseases prevalent at sea. There is virtually no archaeological evidence for any of them in the Tudor period.

1. **Scurvy and nutritional deficiencies.** Scurvy, a condition caused by a lack of vitamin C (C) was the greatest killer of sailors until the end of the 18th century when the Admiralty accepted Lind’s findings on lemon and orange juice (BR 2193: 0103.2). Deficiency of C leads to defective collagen and osteoid synthesis which results in retarded skeletal growth and most significantly haemorrhaging of small blood vessels in the skin, muscle and subcutaneous tissues (Aufderheide and Rodríguez-Martín 1998: 310).
Pimentel (1993: 328) comments that during 1500-1800 scurvy killed more mariners than all other diseases and traumas combined. Scurvy can also form a lethal synergy with other shipboard illnesses such as tuberculosis and tropical diseases (Bown 2004). The first recorded incidence at sea seems to have been Vasco de Gama’s 1498 voyage to India. It was not until the post-Henrician maritime expansion that English mariners encountered scurvy, which entered the Oxford dictionary in 1565 (Aufderheide and Rodríguez-Martín 1998: 312).

Much is made of the lack of acceptance of C as a cure that permeates the history of scurvy. What is key to us is what was known in the 16th century, much of which is covered by Aufderheide and Rodríguez-Martín (1998: 310-3). The key points are summarised here—

- In the 16th century there was nothing approaching modern nutrition, diet was considered part of medicine which was still based on the humoral theory (Barton 1976: 179). The idea of deficiency did not fit with the Galenic view of the body as a self-sufficient microcosm that could only become diseased by the external influence of the macrocosm, its surrounding environment (Aufderheide and Rodríguez-Martín 1998: 313). Also, Tudor military and naval surgeons who were most likely to encounter scurvy were not permitted to practice medicine.

- While lemons and oranges were known as an anti-scorbutic in the 16th century, there were other competing preventive measures that seemed equally valid. Even Lind’s famous experiment included substances that were found to be completely ineffective. The significance of citrus fruit was obfuscated further by the fact that C content can be depleted or destroyed by the manner of handling, preservation and preparation. Indeed the main reason for the non-acceptance of lemons and oranges as a cure was that it could not be explained why they were a cure (Bown). It was not until 1914 that Funk suggested the concept of vitamins and only in 1928 that Szent-Gyorgyi discovered a substance in lemons and oranges called hexuronic acid, which Svirbely demonstrated was vitamin C in 1931. It was only then that the full picture of C as the specific cure for scurvy emerged and hexuronic acid was renamed ascorbic acid (Pimentel 2003: 330).

- Scurvy is often encountered in situations where there are also deficiencies of other substances. This can compound the understanding of the mechanism of illness as the symptoms of other deficiencies (such as beri-beri) begin to take hold and C as a hydrogen donor is depleted by substituting for other deficient chemicals in the body. In the deprivation of the shipboard environment dietary deficiency can include many
substances and introduce many adverse environmental factors which obscure the precise mechanism of scurvy. Even the enlightened Clowes (cited in Keevil 1957: 99) lists bad victuals, lack of exercise, bad hygiene, climate and bad air as the complex responsible for scurvy. Scurvy also has extensive differential diagnoses (Pimentel 2003: 331: table 1.) which could be applied to many descriptions from primary sources.

When Edward Baeshe became the contractor for naval victualling in 1565 he agreed to provide a standard ration based on the traditional naval pattern. This amounted to 4 ounces of butter and ½lb of butter a week, a gallon of beer and a pound of bread (fresh bread in port, ship’s biscuit at sea) daily; On the four ‘flesh days’ of the week (Monday, Tuesday, Thursday, Sunday) either 2lbs fresh beef, ½lb salt beef or ½lb bacon and on the three fish days (Wednesday, Friday, Saturday) either quarter of a stockfish or a four herrings (Rodger 1997: 235).

Rodger (1997: 235) states that as long as this ration reached the men while it was of acceptable quality it would provide a fully adequate 4,257 calories a day, without considering the unofficial fruit and vegetables it was known to have been supplemented with.

2. **Typhus.** Also known as gaol fever, typhus was spread by body louse and spread easily in crowded ships before the introduction of issued clothing and provision for personal hygiene (BR 2193: 0103.3). The introduction in the 16th century of impressing sturdy beggars and other criminals into the navy straight from gaol (Keevil 1957) would likely have increased the incidence of shipboard typhus. Lind made the connection between personal hygiene and typhus in the 18th century but it was Nicolle in 1909 who discovered that body lice were the transmission vector (BR 2193: 0103.3).

3. **Pulmonary tuberculosis.** Pulmonary tuberculosis (TB) is recognized as a long-standing occupational disease of sailors (BR 2193: 0103.4). This is due to TB thriving in the overcrowded poorly-ventilated conditions between decks, the damp atmosphere in wooden ships was also a contributing factor as TB does not have a spore phase and relies on a lipid-rich skin to protect it from desiccation. In the mid-20th century the incidence of TB in the Royal Navy was double that in the Army or Royal Air Force seemingly verifying the link between shipboard life and TB (BR 2193: 0103.4). Modern naval medical policy reflects the danger posed by TB below decks. In 1994 the hospital ship *USNS Comfort* provided medical support for the Haitian migrant rescue
effort, as many of the Haitian patients had TB they were not permitted inside “the skin of the ship” and had to be accommodated in tents on deck (Kennedy 2001).

Stirland (2000: 96) suggests that there is evidence for respiratory disease which is possibly tuberculosis in one or two ribs from the *Mary Rose* assemblage. This evidence takes the form of new bone formation on the visceral rib surfaces. However, the earliest recorded case of tuberculosis at sea is not until around 1614, which takes it beyond the timeframe of this work although doubtless it was present at sea earlier than this time (Keevil 1957: 152).

4. Tropical and semi-tropical disease. English mariners did not come into contact with tropical disease until after the Henrician period, when maritime expansion proper began. The first English voyage to meet with tropical disease was Thomas Wyndham’s 1553 trading voyage to Guinea and Benin. On the Benin river around 100 from a complement of 140 died from what is believed to have been yellow fever (Keevil 1957: 87-8).

Tropical disease is difficult to assess because it encompasses many diseases. Research into tropical medicine was not begun until the late 19th century and therefore in Tudor times was dealt with using procedures issued by the captain. The first book on the subject (1598) was written by an adventurer, George Mateson, and as such was not well received by the medical community (Keevil 1957: 119-20). Henry Hawks, a merchant, noted the link between mosquitoes and disease in 1572, but this too went ignored by the medical science for another three hundred years (Keevil 1957: 122).

5. Enteric fever and dysenteries. The two sources of shipboard gastro-intestinal disease seem to have been the bad hygiene and victuals on board.

5.a. Hygiene. It goes without saying that a Tudor ship was an unhygienic environment. All decks except the upper deck were enclosed the only ventilation being hatches, scuttles and gunports, which would have to be closed in bad weather. The dampness caused by the absorbancy of the ship’s timber was augmented during bad weather by water washing over the decks and into the ship’s interior. Open braziers and candles added fumes and increased the humidity below decks. The atmosphere would have been even damper for those members of the crew whose quarters were on the orlop deck which was below the waterline. On the orlop deck there were also the holds for food storage which were unfortunately close to the bilges where water and
decomposing organics collected, another factor adding to disease on the orlop deck was that it was also where any live animals were kept (BR2193: Art. 0102).

The bilges were without doubt the least hygienic place on board, the lowest compartments of the ship which held the ballast, leaking seawater and the downward gravitation of water and organic rubbish soon turned them into a virtual sewer. The size of the ballast controlled how much surface area was available for algae, fungi and bacteria to grow and unfortunately sand was widely used until around 1600 after which larger items came into use (Simmons 1997: 7). Sir William Wynter of the Navy Board recognised the link between ballast size and disease and advised the use of larger ballast in 1578, but was ignored. Also, in 1590 Sir John Hawkins began to try and reverse the trend of moving the cook-room to the hold to guard against fire when he removed the cook-room of his flagship Mary Rose to the upper deck having realised the risk the bile posed to the stored food and cooking area (Keevil 1957: 115). The positioning of the cook-room in the hold seems to date to the early 16th century when the new larger designs of sailing ships with large crews and longer sailing times came into use.

Many potential food poisoning hazards seem to have been avoided by the toilet arrangements which simply disposed of excretes straight into the sea by use of primitive toilets on deck or over the side of the ship or collection buckets. However there were complications which negated this. Rough weather or fatigue often meant that those onboard used the bilge as a toilet which they were prohibited to do but was less risky than drowning. Pumping water out of the bilge resulted in it being dispersed on deck to run off again (Simmons 1997: 6-7). Bergreen (2003: 109) also notes a lack of expedient wiping material at ship toilets only a length of pitch-covered rope which was presumably washed by being left to dangle in the sea and re-used. On land expedient material such as smooth pebbles and leaves and mosses were available. Seawater drawn for use in cooking and cleaning became deadly when drawn from contaminated harbours and is blamed for the epidemic which annihilated the victorious fleet which faced the Spanish armada in 1588 (Keevil 1957: 72).

While keeping the ship clean was emphasised in contemporary naval practice their was virtually no provision for personal hygiene and the Tudor introduction of impressments meant that many in the crew were drawn from destitution or prison and had no conception of the importance of keeping the ship clean (Keevil 1957: 71)
5.b. Victuals. Henrician victualling was chaotic and disorganized, relying on purveyance—the Crown’s right to buy at fixed prices. Purveyance drove up local prices by increasing demand and was a system abused by both the crown and the suppliers. The crown tried to keep the cost of victuals down by depressing the prices it would pay, and then it would only settle these debts sporadically, in turn suppliers would provide goods of poor quality and short measure where possible. Severe tooth wear seen in Seaman Swan and the crews of the Mary Rose and Vasa attest to the low quality and possible adulteration of flour used in the pastry products eaten at sea, although the flour used on land was not much better (Kvaal and During 1999; Stirland 2000 and C. Martin and S. Black in press 2004).

Victualling was the one aspect of naval administration that the Navy Board did not cover, it being the duty of the ship’s purser to organise the victuals, using money provided by the fleet’s treasurer (Rodger 1997: 234; Loades 1992: 34-5 cited in Stirland 2000: 39). These treasurers were not even permanent offices, being filled on a campaign basis by bishops or officers of the royal household, largely amateurs and novices at such a task (Rodger 1997: 234). Preserving ship stability also meant that there was inadequate space for the amount of food realistically needed (Shephard 2000: 196).

It was not until 1550 when Edward Baeshe was made “General Surveyor of the Victuals for the Seas” that the Navy Board created a full-time post was for victualling. At the time of his appointment Baeshe can be considered as expert as any with long experience in victualling and a network of agents and contacts. Baeshe’s efforts were better than those who went before and after him but he had the fortune to work in a period that was mostly peace-time (Rodger 1997: 235).

Having been supplied with food of questionable quality further problems were posed in preserving it in order to take it to sea. The only methods of preserving food in the 16th century were drying, drysalting and packing in salt pickle (Rodger 1997: 235). Only food pickled in brine or vinegar was safe from damp but these barrels were often too bulky to be carried in number (Shephard 2000: 196). Packing meat in salt and brewing beer could only be done safely during the winter and even goods prepared at this time could only be expected to last for a few months, particularly in warm weather. The integrity of the casks in which the victuals were packed was also crucial, but both casks and the coopers who made them were often in short supply when victualling was being done (Rodger 1997: 236).
Timber sailing ships of the post-medieval period had wooden hulls which absorbed water, this increased their buoyancy but also made them very damp. For this reason food stored below deck was liable to be ruined if not properly stored, dried food became damp and rotted as did salted food as the salt itself was absorbent. Meat had to be heavily salted to survive at sea, so heavily that it sometimes had to be desalinated before it could be cooked. However, only sea water could be used for cooking and the meat was often white with encrusted salt when served (Shephard 2000: 196-8).

Annotated Bibliography and Reading List


Bergreen tells the story of Magellan’s first circumnavigation of the globe using information from primary sources.

Covers the history of scurvy and attempts to understand and cure it.

Royal Navy handbook, only available by application to Royal Navy under Freedom of Information Act.


A useful reference book for underwater and maritime archaeology.


This is one of many volumes published by the Hakluyt Society (http://www.hakluyt.com/) who are inspired by and named after Richard Hakluyt (1552-1616), collector and editor of travel narratives and other documents relating to English interests overseas. The society aims to advance knowledge and education in world history by publishing scholarly editions of primary sources on the voyages and travels of many individuals from around the world.

A compact volume which provides an overview of the history of the English Navy.

Useful condensation of the progress of naval warfare.

Still the standard work on the history of English naval medicine, essential reading for this subject.

Useful condensation of the complex evolutionary history of ship design and construction.


The history of the 1553 expedition written by an experienced sailor using many primary sources.
The Mariner’s Museum. (http://www.mariner.org/)
The American maritime museum online, contains many useful resources for maritime history.


National Maritime Museum (http://www.nmm.ac.uk/)
The British maritime museum online, contains many useful resources for maritime history.


The essential history of the British navy from 7th to 17th centuries.

Book on history of food preservation, includes chapter on food preservation at sea in Age of Sail.

Book based on a Masters dissertation about the history and archaeology of shipboard toilet arrangements.


This journal frequently contains useful articles on maritime history which are occasionally relevant to the study of naval medicine.

Woodall, J. (1617) *The Surgions’s Mate*, London.
Handbook created for surgeons of the East India Company. Woodall has recently drawn criticism due to his minimal maritime experience and use of the works of Clowes and other EIC sea-surgeons in preparing this work.

Short section on William Clowes.