

Roman Military Medicine

Roman Military Medicine:

*Survival in the Modern
Wilderness*

By

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To Ellie and Brent.



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FOREWORD

Despite the formidable empire it would become, Rome had humble beginnings. Around 753 B.C., settlements began around Rome and Etruscans overtook the Palatine Hill, which overlooked a crossing on the Tiber River. The Etruscans then unified the scattered hamlets of Latins, Sabines, and other Etruscans into a city-state ruled by the Tarquin family.¹ Encompassing two million square feet, 44 provinces, and 40 million people, the Roman Empire extended from the rugged Highlands of Scotland to the unforgiving desert of Arabia. While Rome was defended by local citizen-soldiers who were ranked on a wealth basis, the monarchy only trusted those who owned land to defend the city. They formed a heavily armed infantry as companies of 100 men joined, thereby forming what is known as a phalanx. Nearly two and a half centuries after the Roman settlements began, they overthrew the Etruscan monarchy and established a republic. Through the gradual subjugation and assimilation of neighboring tribes, Rome began to expand. The Gauls invaded the Italian peninsula in 390 B.C. and, before returning home, ransacked Rome. The Celts continued to raid central Italy for another 50 years.² The course of Roman policy was shaped by the humiliation created by this defeat and the unremitting threat from Gaul.

Rome's dictator, Marcus Furius Camillus (c. 396–367 B.C.) took steps to strengthen the military when Roman leaders realized that the city's survival and prosperity depended upon the development of a professional army. Troops were organized into tactical units of two centuries of 120–160 men, called maniples. They employed a precise chain of command with centurions (company grade officers) and tribunes (field grade officers) to command them. By 227 B.C., Rome controlled the entire Italian peninsula through three wars with Carthage (264–146 B.C.), which added the provinces of Sicily, Sardinia, Corsica, Further Spain, Hither Spain, and Africa. It also gained control of Greece, Syria, Bithynia, and Pontus through a series of wars with Macedonia and Mithridates VI of Pontus. The superiority of the Roman legion over the Macedonian phalanx was proven in the battle of Cynoscephalae (197 B.C.). Additionally, Transalpine Gaul, Cisalpine Gaul, Illyricum, Crete, Cilicia, Cyprus and Cyrene were added through smaller wars and King Attalus III willed the province of Asia to Rome upon his death in 130 B.C.

Between 104–102 B.C., Consul Caius Marius further reformed the military. His reforms called for men of all classes who met the qualifications to be recruited. He also reorganized the army. Marius relegated the maniple to an administrative body and utilized the cohort as the standard tactical unit. The following is a breakdown of the organization. Ten cohorts averaging 480 men comprised a legion, which had between 4,200 and 5,000 soldiers. During a battle the men of a legion formed three lines. There were four cohorts in the first line and three cohorts in the second and third lines. Depending on the demands of battle and the commander's intent, a legion could confront an enemy force in a line formation or other ordered arrangement, such as a square, rectangle, wedge, half square or circle, or *testudo* (a cover with overlapping shields).³

Auxiliary troops, recruited from non-Roman citizens, were used to supplement the legions. These troops were about as large as the regular army.⁴ These men were often skillful with particular weapons and their members included archers from Syracuse, Crete and Syria, slingers from Syracuse and the Balearic Islands, cavalry from Transalpine Gaul, and some German tribes.⁵ There were cavalry, light infantry, mixed cavalry, and infantry auxiliary units. Roman generals usually placed their heavy infantry at the center of their battle position, while the cavalry was positioned on the flanks of the legion to exploit any breaks in enemy lines. 512 auxiliary horsemen were assigned to each unit; these were divided into 16 *turmae* (squadrons). The auxiliary infantry was organized into centuries of between 500 to 1,000 men and they were often assigned on the frontiers of the Empire.⁶

A clear chain of command was used within each legion and its makeup will be discussed here. Miles (privates) within a century were under the orders of the *tesserarius* (guard sergeant), *option* (lieutenant), and *centurion* (captain). Above them was the *primus pilus* (chief centurion of a legion). Higher in the chain of command was the *praefectus castrorum* (Roman camp commandant), and above him were six *tribunes* (colonels). A *legatus* (general) commanded an entire legion. During the Republic, men had to complete ten years of military service as a condition for elected political office and this meant that the army's commanders were also politicians.⁷ Military service was encouraged during the Empire but it was absolutely required for entry into the Roman Senate.⁸ Support personnel like surveyors, engineers, armorers, medics, farriers, architects, smiths, and musicians was assigned to each legion.⁹

Soldiers carried 60 pounds of equipment on the march. The legionnaire had the *gladius*—a short, stabbing sword—as his primary weapon. He also carried two *pila* (javelins) and a *scutum* (long shield). He wore linen underclothes with tunics or kilts made of wool, trousers for warmth in cool climates, and sandaled wrappings with thick soles to protect his feet. Reinforced leather jerkins and mail shirts formed of small iron rings (*lorica hermata*) were used for early body armor. All legionnaires wore segmented plated armor made of metal strips and plates (*lorica segmentata*) by the time of Tiberius (A.D. 14–37). Where bronze was used to make early helmets, the later ones, which also had neck protectors and cheek guards, were made with iron. Artillery pieces of ten onagers and 60 ballistae were designed to shower an enemy with stones, arrows, and darts with an accuracy of up to 200 yards; they could also discharge flaming missiles. Legionnaires were able to construct effective siege engines. Each century had a *signifier* (standard-bearer); while *aquiliferi* carried *aquilae* (legionary standards).¹⁰

Centurions submitted Roman soldiers to harsh training and discipline. This included running, jumping, tree-felling, swimming, long marches in formation, proficiency in weapons, and constructing fortified stockades.¹¹ Orders from higher ranks were absolute rules of law.¹² On the one hand, those who served and fought well were rewarded in the form of pay, promotions, decoration, and plunder. On the other hand, those who served or fought poorly were penalized with fines or floggings for minor infractions. Legionnaires could also be stoned to death by members of their own units for cowardice in battle or for falling asleep on guard duty. The Roman army employed decimation, which is where a lot is selected and every tenth man of a unit that had deserted or mutinied was killed. Any man who stole from the camp, gave false evidence, committed homosexual acts, or was found guilty three times for the same crime was beaten to death by fellow soldiers.¹³

The army generally fought to annihilate the enemy and commanders always estimated the possibility of fighting a decisive battle in any given situation. For example, in 146 BC, nine-tenths of the population had perished in battle or by disease and starvation during the fall of Carthage. The Romans completely destroyed the city and sold the survivors as slaves. Slingers and archers skirmished in the front; the auxiliaries formed the first line and were seconded or sustained by the legions; the cavalry covered the flanks; and military engines were placed in the rear.¹⁴ Assaults often began with an artillery barrage at long range and, as the two armies closed, slingers and archers launched their stones and arrows. The legionnaires hurled their javelins, drew their *gladii*, and jogged forward to engage in hand-to-hand

combat once they were within close range.¹⁵ The enemy could not hurl the pilum back because it designed so that its point would ben upon impact; additionally, the head would usually break off from the shaft.

A strategy of attrition, which was designed to gradually wear down and exhaust an enemy's energy or resources, was rarely used by Roman generals. During the Second Punic War (218–201 B.C.), Quintus Fabius Maximus conducted a campaign of delays and harassment against the Carthaginian army when he realized that the Roman legions could not engage Hannibal's army without sustaining significant casualties.¹⁶ Livy wrote in 217 B.C. that "the wise delaying tactics of Fabius [...] gave Hannibal much cause for anxiety, as he could see that at last the Romans had chosen a war leader who [...] was capable of a rational plan of campaign."¹⁷

Though they were efficient at conducting offensive operations, the Romans did not neglect the fundamentals of defense. Soldiers erected an armed camp for the night regardless of how exhausted they were from either their labor or fighting. Legionnaires formed an embankment by digging a ditch around the entire camp and throwing earth inward. Inside the camp, the quarters, storage places for weapons, animals, and equipment were arranged methodically. Maniples and cavalry squadrons performed guard duty until they were relieved, or the legions left the campsite. When the legionnaires were not fighting, they often built roads or great public works. The Praetorian Guard, an elite force created by Augustus (Gaius Octavian) (63 B.C.–A.D. 14), protected the emperor. The Praetorian later possessed a brutal influence over Rome and its emperors.¹⁸ The Roman government established *coloniae* (settlements) in order for veterans in occupied lands to live and farm on. These *coloniae* served as centers of direct Roman rule.

The Branches in Detail

The Navy

Roman leaders fashioned naval instruments for each separate need during the Republic.¹⁹ The building and maintenance of a permanent navy was crucial if the Empire was to become a dominant Mediterranean power. Shipyards, sailors, and vessels of many foreign fleets were at Rome's disposal through the conquest of Greece, Asia Minor, and the eastern Mediterranean. Roman shipbuilders used Greek and Carthaginian models to construct their warships but Romans developed the *corvus* (naval grappling hook) and *harpax* (naval grappling hook launched from a catapult), which

were designed to seize and hold an enemy vessel to a Roman warship. These innovations rendered enemy ships vulnerable to boarding and attack by highly skilled Roman marines.²⁰ Free citizen-soldiers, including oarsmen, formed the backbone of the Roman navy²¹ but popular movies, such as *Ben Hur* (1959), inaccurately portray slaves serving as oarsmen on board Roman galleys.

While fleets had their own officers, the Roman navy was under the supervision of the army. Each ship had a trierarch (captain), with a staff headed by a beneficiarius (first mate), a centurion, and his aides. A group of vessels formed a squadron under the command of a navarch (senior captain) and a classis praefectus (admiral) commanded an entire fleet.²² The port of Misenum (now Miseno) in the Bay of Naples was the headquarters of the Roman Imperial Navy. Ravenna (now silted up and inshore), and Forum Julii (now Frejus in Southern France) were also important naval bases. Fleets were added for the patrol of Egypt and Syria by Emperor Augustus. Later, there was a fleet stationed at Gesoriacum (Boulogne) in northern France and also subsidiary fleets on the Rhine, the Danube, and the Black Sea.²³

Roman shipbuilders constructed vessels along Carthaginian designs during the First Punic War (264–241 B.C.). By the end of the Third Punic War (149–146 B.C.), the quinquereme, so named because it had five banks of oars, was the mainstay of the Roman navy. The vessels were 120 feet long and 20 feet wide, with a crew of 300—not including marines—and catapults mounted on their decks.²⁴ A quinquereme was designed to accommodate ten standard arrow-shooters and two stone shooters capable of firing five-pound balls.²⁵ Rams on the bows of ships contained three spikes meant to smash an enemy ship or destroy its oars.²⁶

The Roman navy employed faster, lighter triremes that had three banks of oars and liburnicae, which were light, fast galleys during the reign of Augustus. Triremes were 110 feet long and 12 feet wide with a crew 200, not including marines.²⁷ Smaller transports, privateers, and cutters were also deployed. Roman sailors painted eyes on the bows of warships just above the beaks.²⁸ The Roman Imperial Navy carried out a regional defense system with squadrons off Syria, Egypt, Mauretania, the Black Sea, the English Channel, and the Rhine and Danube rivers.²⁹ The fleets at Misenum and Ravenna had considerable strength throughout most of their existence: at one time they reached 15,000 men and, together, the provincial squadrons were possibly as strong.³⁰ The navy was used to patrol coasts; confront pirates and other adversaries; protect merchant ships; transport troops,

supplies, and officials; transmit orders and news; and, occasionally, to conduct amphibious warfare.³¹

The Marines

Roman marines (*classarii*) served on ships in close association with Roman naval forces in that they were an integral part of amphibious and offensive sea-ground task force operations. The marines were mainly non-Italians from various parts of the Mediterranean; although they received Roman citizenship after 26 years of service.³² Marines served in centuries aboard ships and were under the command of centurions. Roman military leaders pared down the hierarchy of the century to meet the needs of the simpler ship unit.³³ The naval century was an inevitable development in organization because there were no legions in Italy to provide marines.³⁴

When a Roman warship encountered an enemy vessel, marines engaged adversaries at close quarters by deploying the *corvus* or *harpax*. They also set up wooden towers on the deck at the prow and stern so archers and javeliners could use them to fire down upon a foe. The towers were collapsible and could be put in place just before a ship went into action.³⁵ Marines used scythed lances, battle axes, and boarding-swords in battle³⁶ and wore heavier armor and carried stronger and larger shields than legionnaires in order to protect them from enemy missiles.³⁷ Marines were the initial strike force during amphibious operations.

Amphibious Operations

Roman commanders relied on amphibious operations and they were, indeed, one of their most potent capabilities as the invasions of Carthage in 204 B.C. and Britain in A.D. 43 demonstrate. Army and marines in offensive invasions or temporary hit-and-run raids of the enemy homeland and colonial possessions were sealifted and supported by the Roman navy. Landing support sometimes involved shore bombardment, logistical support, and the ability to retrieve the landing force. Before such offensive amphibious operations could be undertaken, overseas advanced bases were usually required.³⁸

The flexibility and potential to achieve surprise of an amphibious task force are mainly responsible for its usefulness. Tacitus reported that in A.D. 70 there was a clear distinction between sailors and marines in the German fleet and that the fleet “assailed by sea the winter quarters of two cohorts, which was the nearest point to attack.”³⁹ That said, an amphibious operation must

deal with difficulties that land combat operations do not encounter. These include natural forces, such as sea, surf, and features of hydrography; logistical problems involving loading troops, equipment, and animals, so that they can be disembarked in proper sequence upon contested beaches; and the danger of landing forces from ships whose maneuverability is restricted to relatively fixed locations.

The challenges enumerated above made close cooperation and coordination between legionnaires, naval, and marines an essential necessity for success. With regard to the campaign Gnaeus Julius Agricola waged against British tribes in southern Scotland and Wales between A.D. 77–84, Tacitus wrote that “the spectacle of war, thus pushed on at once by sea and land was imposing, while infantry cavalry, and marines, mingled.”⁴⁰ That these ancient people were able to successfully carry out this kind of complex, synchronized operation makes Roman warfighting deserving of great tribute.

Military Medicine

Scholars often overlook the importance of medical personnel within legions as an aspect of the Roman military system. Skilled military medici (physicians) improved the treatment of casualties and the fitness of soldiers. According to Vegetius, soldiers who became sick could “be nursed back to health with suitable food and tended by the doctors’ art.”⁴¹ Surgery was also an essential part of a doctors’ practice when they were assigned to the legions. By allowing the noncritically wounded to return to battle more quickly, medici and other medical specialists further enhanced the readiness and sustainability of legionnaires in combat. Medical personnel within the legions also helped to maintain the morale of the Roman armed forces. Additionally, naval forces had medici dupliciarii (physicians who received double pay) aboard their ships.⁴²

Military physicians mainly treated rich officers within the army during the period of the Republic (509–31 B.C.) while common soldiers had to purchase medical treatment from local civilian physicians, or receive first aid and other remedies from fellow soldiers.⁴³ However, after the formation of the Roman Empire under the leadership of Octavian (Augustus) Caesar (27 B.C.–A.D. 14), Rome hired physicians to provide medical treatment for the entire army. These physicians became officers or senior noncommissioned officers and they received retirement benefits. The physicians developed manuals to help standardize medical treatment in the legions and conducted physical examinations to ensure that only healthy recruits entered the

military. Sanitation and preventive health measures such as constructing and maintaining latrines, encouraging daily bathing (even in the field), providing netting for protection against mosquitoes, and ensuring that soldiers exercised daily and had an adequate and nutritious diet were the responsibility of medical personnel.⁴⁴

These improvements allowed Roman legions to benefit from the highest level of military medicine in the ancient world. Physicians provided limited medical training to certain soldiers (*capsarii*) who served in forward areas with the troops and they provided care to injured soldiers in combat, such as bandaging wounds to control bleeding. The army also had special units that evacuated soldiers from the battlefield, so that they could receive treatment in field hospitals. Roman doctors in hospitals employed triage to immediately sort patients according to the type and seriousness of injury, likelihood of survival. They established priority with regard to treatment as a means to provide greatest medical benefit to the largest number of injured persons.⁴⁵

Medical personnel who specialized in medical ointments, snake, and scorpion stings, and convalescent care worked in field hospitals. Medical innovation was crucial to the maintenance of the military system; for example, the development of the tourniquet and ligation to control bleeding allowed surgeons to amputate with greater safety. Medici developed new surgical instruments to help extract missiles, such as arrowheads; they applied antiseptics, including acetum, barbarum, and lint and honey to wounds in order to reduce the risk of infections; and sterilized surgical instruments in hot water. They also used preparations made from opium, henbane, and white mandrake root as sedatives and analgesics.⁴⁶ The reformation spared no expense where health of troops and animals was concerned. In short, without the reformation of the medical aspect in the military and the modernity it possessed, it may not have had such an advantage over its adversaries.



CHAPTER I

INTRODUCTION

Contemporary innovation, which is remarkable in its own right, must still begin with a nod to the Romans. This is relevant to their construction methods, artistic marvels, and education, as well as most facets of ancient daily life. It is common to encounter volumes on military strategies and battles during these times; however, military medicine is one of the most understudied components of Roman life. Although, this does not mean that modern military medicine is completely different from its Roman counterpart. The military's medical advancements were more than likely crucial with regard to the edge the Romans had over their opponents. However, like their enemies, it can be assumed that men were initially forced to be mostly self-reliant. As previously mentioned, under Caesar, physicians were hired to treat the army. After the military system was reorganized under Augustus and permanent camps were established, medici were appointed to each division. This reorganization of the system made healthcare much more efficient and helped to provide more positive results.

Contemporary writings tell the daily routine of the camp and they also reveal the precision and discipline with which they regarded every aspect of their operations, medicine included. Upon finding adequate grounds, the soldiers, who were many in numbers and skilled, quickly built a fortified camp. Once the camp was complete, the soldiers were assigned to their tents by company. The same system was charged with procuring wood, food, and water. All the men took their meals together and their camp schedule—e.g., their sleep, sentinel duty, rising times, and the breakdown of camp—was signaled by trumpets.

This work begins by discussing sanitation in Roman military hospitals and we argue that the Roman public health practices employed in field hospitals between 27 B.C. and A.D. 476 were successful in providing effective medical care after wartime injuries. Another key point that we wish to make is that Roman physicians knew, through deductive reasoning, that pathologic microorganisms existed and that these microorganisms had to be taken into account in their medical practices or patients could become ill

and even die from infections. This line of reasoning leads to a discussion on the control of epidemics in the Roman Army, which posits the idea that the immediacy of treatment by medical personnel in the field and field hospitals was an important aspect of providing care to legionnaires soon after the discovery of a contagious disease. We will then explore acute pain management and demonstrate that the swift return of wounded soldiers to the battlefield was facilitated by the early treatment of traumatic injuries through the use of medical corpsmen and field hospitals.



Figure 1-1. Vindolanda Roman Fort
Credit: © The Vindolanda Trust

We then take a point of departure as we relate the ancient army's experiences to modern day issues of post-traumatic stress disorder and acute stress disorder as we explore whether PTSD and ASD existed Roman legionnaires during the period of the Roman Republic. At this point, this work addresses the handling of injuries. We will begin with the treatment of flesh wounds, which is where we will establish that without the role of excellent wound care the Roman army could not have forged and maintained an empire which encompassed 2 million square miles, 44 provinces, and 40 million people. Next, we will address the treatment of traumatic brain injury and show that the early treatment of traumatic brain injury through the establishment of mobile field hospitals by the Roman army facilitated the survival of soldiers with head injuries. The last chapter, which relies on ancient texts, takes us even deeper into military medicine as

we discuss the treatment of equine flesh wounds. Here we argue that Roman veterinarians were crucial to Roman success in warfare and this is an area which has not been sufficiently addressed by historians. The last chapter relies on archeological studies of Roman artifacts and fortifications to provide a contemporary perspective. It is our intention for modern man to derive some use from this volume, particularly from the medicinal properties of the plants discussed.

CHAPTER II

SANITATION IN ANCIENT ROMAN MILITARY HOSPITALS

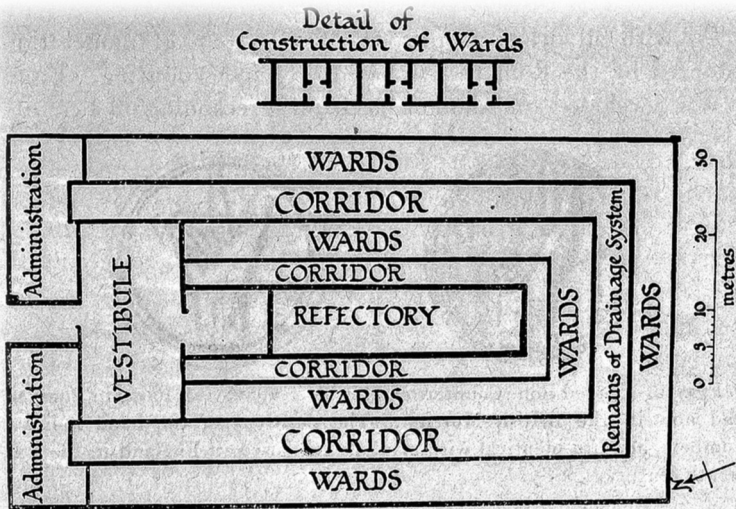


FIG. 15. General Plan of Roman Military Hospital at Novaesium near Düsseldorf. The assigning of the uses to the different parts of the building is conjectural.

Sanitation and an awareness of contagious diseases are essential factors in the successful operation of all military hospitals. Ancient Roman physicians were aware of these factors and addressed them in the structure and system that they developed for their military hospitals. The main purpose of this chapter is to demonstrate that hygienic and sanitation practices in Roman military field hospitals (valetudinaria) facilitated the convalescence of Roman soldiers and allowed them to return to the battlefield as quickly as possible. The key question we will address is the role the field hospitals' hygienic and sanitary conditions played in reviving minimally or moderately wounded legionnaires, so that they could re-entry into military conflict. Crucial source information is extracted from Roman historians,

physicians, artifacts, monuments, paintings, archaeological discoveries, and modern secondary sources. Our main arguments are that Roman field hospitals provided greater hygienic and sanitary conditions than those practiced by most of their enemies, and that the Romans developed the first system of public health in its military hospitals. Roman field hospitals were a Roman innovation and this book deconstructs several aspects of this health care system to support this thesis.

The key components to understand in this chapter are community hygiene and sanitation. Community hygiene means the practice of health of a large group of people, such as a field army.⁴⁷ Sanitation refers to the formulation and application of measures to promote and establish conditions favorable to health.⁴⁸ The main assumption is that without the role of excellent medical care in a hygienic and sanitary environment, the Roman army could not have forged and maintained its immense empire. Our research suggests that a better grasp of different components of military medicine leads to a better understanding of Roman military successes in warfare. The main point of view presented in this chapter is that Roman public health practices in field hospitals employed between 27 B.C. and A.D. 476 were successful at providing effective medical care after wartime injuries. The thesis of this paper is that Roman physicians knew, through deductive reasoning, that pathologic microorganisms existed and that these microorganisms had to be considered in their medical practices or patients could become ill and even die from infections.⁴⁹

Methods

This study was conducted within the parameters of the system and structure analysis. Central to the analysis of military hospitals is the study of their structures and processes. This type of analysis represents an attempt to assess the relationships of structure and process within contemporary and historical contexts. History is a crucial ingredient, not merely as a basis for descriptive narrative but also as an important means of discerning and comparing repetitive phenomena as they relate to sanitation in Roman military hospitals.⁵⁰ This historical study shows how physicians and other healthcare professionals can better appreciate the fullness of their medical and cultural inheritance as practitioners, thereby enabling them to become more conversant in the passing and advancement of about sanitation in military hospitals from an extinct civilization to sanitation techniques in modern, military hospitals.

There are too many primary and secondary sources which relate to public health matters in *Valetudinaria* to list all of them in this section. The most useful primary source was the work of Flavius Rhenanus Vegetius (later 4th century A.D.) who discussed sanitation and hygiene in military encampments and the preservation of the health of soldiers.⁵¹ Another valuable source was the discussion by Roman physicians, such as Cornelius Celsus (c. 25 B.C.–c. AD 50) and Claudius Galenus (Galen) (AD 129–c. 199) about the aseptic techniques they employed and their use of bacteriostatic and bactericidal medicines.⁵² The Roman concept of pathologic microorganisms is best expressed by Marcus Terentius Varro (116–27 B.C.). Also, Pedanius Dioscorides (A.D. 40–80) compiled an extensive catalog of medicinal products and their uses.⁵³ Among the more useful secondary sources used in this study are Davies (1989) *Roman Service in the Army*, which is based on primary source documents, and Gabriel (2012) *Man and Wound in the Ancient World*, which contains both primary and secondary sources. Scarborough (1969) *Roman Medicine*, and Gabriel and Metz (1992) *A History of Military Medicine* were also of value.⁵⁴ Arnold Blumberg has written an excellent article about the construction of Roman camps, while Richard A. Gabriel has written about Roman military hospitals located on Roman camps and forts.⁵⁵ In addition, the primary author conducted extensive research at ancient sites throughout Europe and in museums that contain Roman artifacts.

Findings

We found that hygiene and sanitation were regularly practiced in all military hospitals. Roman physicians took steps to reduce sepsis and they also separated sick and wounded soldiers in the hospitals to minimize the spread of contagious diseases. Roman military hospitals were located inside Roman camps (*Castrae*) or forts (*Castella*). The camps and forts occupied an area of 5 acres to 18 hectares and this was in addition to fortified ditches, stockades, and other defensive devices that surrounded them, which also included a 5ft wide and 3ft deep ditch.⁵⁶ They were laid out in a square or rectangle with rounded corner angles. They were located in an area with plentiful wood and forage and were not overlooked by higher ground whenever possible. The average field hospital occupied an area of 6000 square feet and could accommodate between 250–500 patients but ward tents could be set up near the hospitals in the event of mass casualties. Roman army camps were situated near streams or rivers, and away from marshes, swamps, and standing water. Arid plains and hills were avoided whenever possible. Every hospital had wards, corridors, administrative

offices, a dining hall, and a drainage system. There was also an operating suite, lavatories, sewers, mortuary, kitchen, a set of baths, and storage rooms for medical instruments and medicinal agents. The bath area was attached to a gymnasium for exercise or massages. Roofs were designed to provide adequate cooling and ventilation, and a heating system provided warmth during cold weather. Roman military hospitals stressed hygiene, cleanliness, and sanitation.⁵⁷

The Roman military selected only the healthiest and most intelligent available men for service as legionnaires.⁵⁸ Roman military physicians advocated a regimen that was designed to promote the health of soldiers, and we will discuss this in more depth later. Celsus recommended recreation; rest; a varied diet which included fruits, vegetables, boiled meat, and wine diluted with water; exercise; daily gargling with cold water; and frequent bathing.⁵⁹ Soldiers were also required to shave daily. Healthy legionnaires first took a hot bath in the caldarium, then in the lukewarm tepidarium, and then they dipped in the cold frigidarium.⁶⁰ Every night, while others slept, a detachment of soldiers performed HP (hospital police) duties. The detail cleaned the entire hospital, including the kitchen, baths, latrines, and surgical suite. The medicus tesserarius (officer of the watch) monitored cleanliness, and a medicus decanus (sergeant or corporal) ordered the specific tasks for the policing detail. Mosquito netting was furnished whenever necessary to all patients and hospital staff. Daily exercises, drills, and marches helped to keep the soldiers fit. Legionnaires were subject to periodic medical examinations. Soldiers with serious physical or psychiatric illnesses were medically discharged with retirement benefits. The dead were cremated outside the camp walls.⁶¹ ⁶² A complex system of drains and sewers emptied into rivers or streams well below the watering point for animals. Wooden seats were situated over the main sewer running around 3 sides of the building. A smaller channel, which fed from the water tank, was used for washing sponges instead of toilet paper. When it was not possible to drain refuse into a moving waterway, a large soak-away was constructed. Latrines were continuously flushed by water from the bathhouse, and sewage was removed far away from the fort or camp. Latrines were dug to a depth of 10 feet and covered with wooden tops to discourage disease-carrying insects. Latrines had basins for washing one's hands.⁶³

Discussion

Roman military physicians used a variety of techniques to prevent or inhibit the growth of causative microorganisms. All surgical instruments, lint, fibulae, and bandages were boiled in water prior to use. Sick soldiers were housed in separate wards from wounded soldiers, and there were a few rooms for patients requiring isolation.⁶⁴ Roman physicians employed a number of techniques and pharmaceuticals to minimize infections. Picking out decayed or foreign matter from wounds after repeated cleansing with rainwater or other fresh water mixed with ammoniacum (Dorema ammoniacum D.) helped to reduce the rate of tetanus, gangrene, and infections. Loose bandaging, surgical clips for closure drains, and the regular changing of dressings also helped to reduce infections.⁶⁵ When the benefits outweighed the risks, gangrenous tissue was either cauterized or surgically removed.⁶⁶ Roman physicians had a number of antiseptics available for the treatment of wounds and use during and after surgery. Acetum (vinegar) and mel (honey) were among the favorites. Galen recommended a poultice of honey, lint, and aloe vera, after sponging the wound or sutured area with a mixture of acetum and Glaucium (Glaucium flavum). The wound would then be covered with an absus (woolen bandage).⁶⁷ Linen bandages were the most common type of bandage used for binding wounds. Celsus preferred to cover treated wounds with a plaster of barbarum.⁶⁸ The maintenance of hygiene and sanitation would have been impossible without training, discipline, and an organizational structure through which military authority was exercised. A legatus (general), who was supported by six tribunes (colonels), commanded each legion. Second in command of a camp or fort was the praefectus castrorum (prefect of the camp). He had overall responsibility for the organization and operation of a camp or fort. His duties included the maintenance and update of equipment and the training of soldiers.⁶⁹ The medicus primus (hospital commander) reported directly to the prefect.⁷⁰

The medicus primus commanded a valetudinarium and had the final word in all medical decisions. He had a staff of medici, nurses, other specialists, and orderlies. He also served on the staff of legatus as the medical advisor. The medicus primus was assisted by two lieutenants: the optio valetudinarius (hospital executive officer) and optio convalescentium (physician's assistant in charge of convalescence). The staff of the optio valetudinarius had the overall responsibility for the hygiene and sanitation of the hospital.⁷¹ The chain of command was strictly enforced and transgressors or malingerers were severely punished; this structure was another crucial element that facilitated the effectiveness of the Roman army.

The Romans practiced military medicine in field hospitals that surpassed the medical systems used by Rome's enemies in both hygiene and sanitation. Sanitation and hygiene helped many wounded soldiers to heal more quickly and enhanced the survival rate of the wounded. Roman physicians practiced a number of measures to prevent sepsis in their patients. They boiled all surgical instruments, lint, fibulae, and bandages in water prior to use before every operation. They separated sick and wounded soldiers in separate wards and isolated soldiers with highly contagious diseases. Physicians also used a number of antiseptic products in their work. In addition, field hospitals had remarkably high standards of hygiene and sanitation. But would Roman physicians use these sanitary procedures unless they had some knowledge of pathologic microorganisms? Marcus Terentius Varro (116–27 B.C.), a Roman scholar, provides the answer. However, first, we must consider the standard definitions of “pathologic microorganism” and “microorganism”. A pathologic microorganism is “any disease-causing microorganism”.⁷² A microorganism is a “minute living body not perceptible to the naked eye, especially a bacterium or protozoon”.⁷³ Second, consider the theory of contagion developed by Varro: “the pathogen is alive, too small to be seen; it enters the body through the mouth and nose, propagates, and produces many diseases resistant to treatment”.⁷⁴ Varro's theory of disease fits the definition of pathologic microorganisms.



Figure 2-1. Antonine Fort Bathhouse

Credit: Roman Britain