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The King of England Sickness: An Unsolved Mystery

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Recommended Literature and Videos

Please read the articles and view the videos below before beginning this case study.

- *Article:* What Was Sweating Sickness, the Mysterious Tudor Plague of Wolf Hall?
  Gatherer, D. (February 6, 2015). *The Conversation*. <https://theconversation.com/what-was-sweating-sickness-the-mysterious-tudor-plague-of-wolf-hall-37194>
- *Article:* Infectious Diseases, Weather, and Climate.
  Polgreen, P.M., & E.L. Polgreen. (2018). *Clinical Infectious Diseases* 66(6): 815–7. <https://doi.org/10.1093/cid/cix1105>
- *Video:* The Sweating Plague Was Deadlier Than It Sounds
  Running time: 11:23 min. Produced by Weird History. <https://youtu.be/9G_G2dlClUo>
- *Video:* Intro to Epidemiology: Crash Course Public Health #6
  Running time: 14:48 min. Produced by Crash Course. <https://youtu.be/_luU3I03JwE>
- *Video:* Germ Theory of Diseases and Koch's Postulates
  Running time: 4:55 min. Produced by Microbiology Mantra. <https://youtu.be/97sEcWEb3Iw>
- *Video:* Koch's Postulates.
  Running time: 5:48 min. Produced by Biology Professor. <https://youtu.be/xhLmZ3WMCt0>

Part I – The Outbreak

It's the year 1528. Let's place you in the fictional shoes of Dr. Darcy, the royal physician to the King of England. It has been a long year and today's meeting with King Henry VIII is making you fearful for your life. The king is very angry! This is because the English Sweating Sickness is back again causing more horrific deaths in Europe for the fourth time since 1485. As a doctor who lived through its prior deadly epidemic, you are concerned because the spread is wider and the death rate is much higher than the three outbreaks before. The rapid spread and quick, yet painful death has created fear across Europe, especially England. In London, thousands of people were already infected in just two summer months and almost 1,000 residents died. You are especially concerned because it is the warm month of August, just before the weather change that occurs every early fall in England. This appears to be a similar time of year for all four epidemics thus far. While the summer was hot, there were no major disasters such as extreme weather or a food or sanitation crisis to blame.

King Henry is alarmed by the return of this epidemic commonly known as the "King of England Disease," "sweating sickness," or "English Sweat" (*Sudor Anglicus* in Latin). He is personally quite worried about dying from the disease. Several members of Henry's royal counsel already have died, including a duke and many castle staff. Also, while it was

determined that his brother Prince Arthur died of tuberculosis, the king was always suspicious that sweating sickness was really the cause of his death because one of his symptoms was night sweats. However, other major symptoms such as prolonged cough, chest pains, and its lengthy presence of months up to years made tuberculosis an unlikely candidate. And even more disheartening, King Henry spent the past two weeks desperately waiting from afar as his wife, Anne Boleyn was suffering from sweating sickness, but appears to have survived the deadly disease (only to be beheaded later by the king's court order).

After observing the king's paranoia and his subtle threats about the possibility of failure, you decide it is best at the moment to just promise the king the outcome he wants. You will eradicate sweating sickness from the world! So you need to get to work. Since you just returned from your summer holiday vacation, you need to get caught up. You request a meeting with the castle staff to find out what is going on.

The meeting begins with an update on the recent deaths affecting the king. The king's butler shares that the Duke of Suffolk and his brother are dead, and that the king's royal counselman began to sweat last night and was also probably dead by now. The king's assistant interrupts the meeting and complains that the king does not like his breakfast today and it is making him even more mad. No one is willing to tell the king that his chef has been dead for days, and two of his kitchen staff were brought to the castle barn this morning to sweat out their last breaths of life.

You review the large number of symptoms that family and physicians have witnessed and note they are similar to the prior outbreaks. First, individuals present tremors and have chills, followed by a high fever, profuse sweat, and a foul odor. Most complain of tachycardia, delirium, and severe headaches. The timelines of each of the four outbreaks so far are consistent with each other; symptoms appear, and within hours to days, end with either a quick death or a long recovery.

There is a thought amongst the community outside the royal family that is of interest. "Stoupe! Knave and Know Thy Master" and "Stup-gallant" have become sarcastic names for sweating sickness. These names were adopted by the poor, suggesting that this disease predominantly infects the rich and the royal. This is interesting because a recent epidemic known as the plague mostly killed the masses and the poor, yet sweating sickness is becoming known as a rich person's disease. The royal dressmaker reminds the staff of the statement people are using about the rich "dancing in the courtyard at dusk, dead by midnight."

As the physician to the king, the health and well-being of the king and his kingdom is your responsibility, and the rapid spread of sweating sickness is very alarming. You now must be both the royal medical doctor and an epidemiologist. Epidemiologists function like community health detectives, trying to understand the origin and spread of diseases to find the means of prevention and treatment.

Questions

1. What do epidemiologists do? The terms epidemic, pandemic, and endemic are all related to the severity of how much the disease has spread. Explain the difference between an epidemic, a pandemic, and an endemic.

2. Describe the germ theory. How and when did it come to be? What theories were popular in the science community before the germ theory? What was medical treatment like before the germ theory (as in the time of sweating sickness epidemics)?

3. Describe Koch's four postulates for identifying the causal agent of a disease.

4. As you attempt to identify the pathogen causing sweating sickness, you begin with collecting some common information. Identify any pieces of evidence (potential clues) that may be important for narrowing down what disease(s) sweating sickness is most similar to. As you begin to investigate, what type of questions should you be asking? What type of data should you collect to figure out the cause of the outbreak?

5. Were there any major events, like severe weather or a natural disaster such as an earthquake or hurricane? Why is this important to ask?

6. Are there any similarities in the time of year the outbreaks occur? Why would an epidemiologist be interested in understanding the time of year of the outbreak?

7. What factors could determine if a person survives or dies from a disease outbreak like sweating sickness?

Part II – The Symptoms

So much information has been collected today that needs the attention of you and your team. The Sweat has spread from London to all over England and has now entered Germany and Scandinavia. The timing was terrible for the king. As the War of the Roses was ending, England entered a financial boom that brought wealth to its citizens and became a lure for people with money to move to England. This increased purchasing power in England, which resulted in bigger and fancier houses filled with large staff and household goods, including food and drink.

Instead of enjoying the wealth, King Henry is now hiding from this highly contagious disease and has given you a very short deadline to solve the mystery of sweating sickness. Let's take a look at the past four outbreaks. It appears all four outbreaks began in the summer and early fall months. Why these outbreaks are occurring around the same time of year each time is worth looking into.

Table 1. Five sweating sickness epidemics.

Epidemic	*Month, Beginning–End*	*Presumed Starting City*	*Locations*
1485	September–October	Oxford	London and surrounding towns
1508	July–October	London	Greenwich, Eltham, Chester
1517	June, followed by the Plague	London	Calais, Windsor, Oxford
1528–1529	July 30–into the fall	London	Germany, especially Hamburg, possibly as far as Russia and Scandinavia
1551	April–September	Potentially brought to London by Earl of Richmond (later Henry VII)	Shrewsbury, Wales, London

So, we certainly do not need to discuss what happened to the last royal physician to the king who failed to solve the third Sweat epidemic. This is now going to require a team of expert physicians and researchers. Dr. VonMax, an accomplished researcher, arrives from Germany to join the team and you begin. "Dr. VonMax, shall we begin by understanding the common symptoms of sweating sickness?"

Dr. VonMax and his medical team have been busy at work and have identified over 20 symptoms presented by victims of sweating sickness. He reports, "While there are many symptoms, there are twelve that we find to be the most common. My list includes profuse sweat, foul odor, high fever, chills, dyspnea, vomiting, headaches, myalgia, abdominal pain, tremors, delirium, and weakness."

Dr. VonMax continues, "The team has identified other symptoms that may or may not arise. They include coma, dehydration, tachycardia, heart palpitations, paralysis, disrupted breathing, heat intolerance, thirst and dehydration, tachypnea, constipation, diarrhea, chest pain, pain in the extremities, and 'grief' of the liver. Let's keep these symptoms in mind because pulmonary and heart problems can be deadly, and grief of the liver can certainly cause a quick death."

"Dr. Darcy," Dr. VonMax explains, "we need to make sure we understand the connection between each of these symptoms and why they are present. Let's dive deeper into the twelve common symptoms."

Questions

1. In Table 2 (next page), describe the twelve common symptoms of English Sweat Sickness. Include your sources!
2. Why do you think there is so much sweating and such a foul odor?

Table 2. Twelve symptoms of ESS.

ESS Symptoms	*Description*
Profuse sweating	
Foul odor	
High fever	
Chills	
Dyspnea	
Vomiting	
Headaches	
Myalgia	
Abdominal pain	
Tremors	
Delirium	
Weakness	

3. Interestingly, many people considered sweating sickness a disease that affected the rich and royal. Wy do you think it might have affected more of the rich than the poor?

4. The chef and staff died of sweating sickness. Could this be related to the increase in household food, its preservation, or intake?

5. Diseases are typically highest among people living in poverty. Why is this? Can you identify any reasons why socioeconomics can play a role in an epidemic? Provide at least one example.

Part III – The Potential Disease

Well, the standard medical treatments such as syrups, mint, and vinegar cleansing are not working. The new protocol is to keep sweating sickness victims warm, sleepless, and with no water. But even with such stellar treatments, nothing is helping. The death rates keep escalating; one moment a person appears perfectly healthy and then when infected, that person suffers terrible symptoms and faces death within 24–48 hours.

Perhaps sweating sickness is related to a known pathogen that caused an outbreak in the past or a new one related to a future outbreak. After the team reviews all of the symptoms presented by patients, Dr. VonMax calls the team together and says "OK, we agree that there are twelve common symptoms to focus our attention on. Now let's discuss possible pathogens that could cause such symptoms."

Dr. VonMax continued, "Dr. Darcy came up with a top ten list of diseases that may be the cause of sweating sickness. Let's divide the team into groups and each group will be assigned a few of the ten potential infectious agents. We will work together to compare the twelve symptoms to each of the ten candidate agents. Here is the list: hantavirus, anthrax, ergot, arbovirus, influenza, relapsing fever, rickettsialpox, Crimean-Congo hemorrhagic fever, botulism, and enterovirus. Each team will present their findings."

Questions

1. Check the diseases you were assigned and match them with the symptoms listed. Use Table 3 below as a guide. How well do your assigned diseases fit the sweating sickness and relate it to other articles about your diseases and sweating sickness?

Table 3. Potential infectious agents.

Sweating Sickness Symptoms	*Hantavirus*	*Anthrax*	*Ergot*	*Arbovirus*	*Influenza*	*Relapsing fever*	*Rickettsial pox*	*CCHF*	*Botulism*	*Enterovirus*
Profuse sweating										
Foul odor										
High fever										
Chills										
Summer incidence										
Dyspnea										
Vomiting										
Headaches										
Myalgia										
Abdominal pain										
Tremors										
Delirium										
Weakness										

2. What conclusion can your team draw about the possibility of your assigned disease being sweating sickness? As your team prepares to present their findings, include a description of the disease, known symptoms, an explanation of how and why the symptoms fit the disease, and your team's finding if the disease could be a match.

3. Are there any particular symptoms (or combination of symptoms) that can lead to such a quick death?

Part IV – Narrowing Down the Culprit

The team collects the data by comparing the symptoms of sweating sickness with symptoms of other diseases and presents their findings. It is decided that while no symptoms of a specific disease completely match the symptoms of sweating sickness, a few come close and are worth looking at. Let's choose the top three to discuss as a group. As the team decides on the top three, they are looking at common symptoms that could help to create a treatment plan. Historically, sweating sickness has caused many deadly epidemics and then seems to vanish. The team wonders if this is just a mystery or if sweating sickness is a relative to another disease.

Questions

1. Overall, what are your top choices of potential pathogens that could cause the English Sweat or that are the most closely related to the English Sweat?

2. What are some reasons why some pathogens reemerge after disappearing?

3. Let's speculate! Are there any explanations for why sweating sickness caused five epidemics and vanished? Is this just an unsolved mystery or is sweating sickness a relative to another disease?