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Etiology, Epidemiology and Therapeutic History of Malaria Validate Germ-Terrain Duality; Postulates Thereof

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Introduction

The Germ-Terrain duality theory of disease states that the etiology of certain diseases/diseased states is better explained as a complex interplay between germs and the inherent anatomical/physiological integrity of the body cells [1].

It argues that the etiology of certain diseases is not fully explained merely by the presence of germs (Germ Theory) or by a mere loss of cellular integrity (Terrain Theory) [1].

As a result, the prevention and treatment of such diseases should focus not just on fighting germs but on maintaining/restoring the anatomical/physiological cellular integrity.

The Germ-Terrain duality theory is a harmonization of the current Germ Theory (popularized by Loius Pasteur) and the hitherto discarded Terrain Theory (popularized by Pierre Bechamp) [1].

While today largely confined to certain parts of the world, malaria fever [2-4] is a malady which, through time has blighted every single continent on this earth except Antarctica. By virtue of its historical universality malaria is therefore a prime candidate for proof of the germ-Terrain duality (G-T or G-D-T) theory. Malaria (called ague in ancient times) was known as far back as ancient Egypt, Rome and Greece. Some have even blamed it for the fall of the Roman Empire [5].

Epidemiological Validation

The best proof malaria has a terrain aspect to it is the relationship between malaria and the sickle cell disease. The sickling of red blood cells (an anatomical variation) creates resistance to malaria. If malaria was merely germ related this would not be so [1]. If terrain had nothing to do with malaria, sickle cell patients should not have this advantage over disc shaped celled individuals in avoiding malaria.

The geographical distribution of the sickle cell gene and the distribution of malaria match closely in Africa, India and the Middle East [6].

Summary

The epidemiology of malaria supports the Germ-Terrain theory.

Etiological Validation

Tobacco use and/or physical strain under the hot sun, which cause cell and tissue damage have been implicated in the etiology of malaria fever under the germ-terrain duality theory [1]. Heat and radiation can damage a cell by coagulating its contents, as can any adverse stimulus that disrupts the homeostasis of a cell [7,8].

Going through the pages of history, examples abound of cases of malaria being related to physical strain and exhaustion-and exposure to the radiation of the sun.

After a very difficult missionary march under the harsh African sun, the famous missionary Dr. David Livingstone succumbed to malaria [9].

William H Clarke, missionary to Yorubaland, 1854-1858, stated-'at the beginning and close of the seasons, when the earth is in a state of transition and the vegetation is exposed to the intense heat of the sun, we have the greatest danger from malarial fevers [10]. He also stated 'if there be one fact more than others that would tend to act as a cause producing malarial disease it is that influence of the hot sun [10].

Upon his return to the USA, he advised the Baptist missionary board: 'so often the ruin of missionaries and others in a tropical clime is excessive work, over anxiety and exposure (to the sun)'.

He blamed stress under the sun for the "African fever" (malaria). In olden times malaria always flourished under summertime heat. The intensity of endemicity in any area depends first on climate.

Rest and relaxation and removal of stress has even been claimed to cure malaria! 'Blackwater fever or haemo-glubinoric fever used to be a common and much dreaded complication of plasmodium falciparum infection mortality is high, recovery is slow…and complete rest from the moment of the attack is the only universally accepted treatment.

Outbreak of malaria was a problem during many major constructions like that of the Suez Canal and the Panama Canal.

Apart from sports and construction, there is no human activity that involves strenuous activity/physical strain under the hot sun than war. If malaria is partly caused and exacerbated by strenuous activity the best place to look for malaria would be the battle field. And if we scan the battlefields from the dawn of history, we find malaria to be ever present. Little wonder a British officer once stated, 'the history of malaria is the history of war itself!'.

Captain Arthur Trefusis Jones of the Second West India Regiment, Sierra Leone succumbed to malaria on July 7, 1861 after a strenuous month long trek inspecting the Yoruba armies. During one such inspection he was grazed by a stray bullet (massive tissue damage) [11].

Under the physical strain of the Bataan death March under the tropical south east Asian sun, many allied soldiers succumbed to malaria during world war 2 [12].

Under harsh conditions of forced labour, many British, Dutch, Australian and American soldiers succumbed to malaria as POWs of the Japanese [13].

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The following famous individuals/armies contracted malaria DURING war exertions Alexander the great, Sultan muhammed Tughluk in 1351, Genghis Khan (debated), US President Andrew Jackson contracted malaria while fighting the Seminole Native Americans in the early 1820s, French soldiers suffered malaria while fighting the slave rebellion in Haiti in the early 1800s. The French and Austrian armies suffered from malaria while fighting in Italy in 1859, George Washington's revolutionary troops suffered from malaria while fighting in the American war of the late 1700s. In the fourth century A.D., as Alaric, King of the Goths, attacked Rome he got sick with malaria. In 536 Belisarius, leading the army of the Eastern Empire, surrounded Rome, malaria quickly decimated the ranks. Emperor Otto I attacked Rome in 964 to suppress a revolt there but almost all his men died of malaria. The army of Henry II was wiped out by malaria.

Malaria continued to spread throughout North America during the Revolutionary War. Whole British garrisons are recorded as having succumbed to the disease- and some historians even speculate that the eventual British surrender at Yorktown may have been partly due to a severe fever epidemic.

It was realized in the olden days that malaria outbreaks were worse in the summer (more sunlight). In 536 Belisarius, leading the army of the Eastern Empire, surrounded Rome, planning to starve the city into submission. To facilitate their plan, the soldiers ravaged the farms producing food and destroyed aqueducts to cut off the Roman water supply. But they made a fatal error by digging their entrenchments in the Campagna. With summer came malaria, which quickly decimated the ranks. Belisarius himself was severely stricken with fever but survived, a beaten man.

Frederick called Barbarossa, also failed in his attempt to conquer Rome. The army of Henry II was wiped out by malaria, but Henry IV managed to besiege Rome four times, always withdrawing the bulk of his soldiers during the summer months [13].

Last, but not least, alkaloids [6] (such as quinine) and chloroquine [6] used to treat malaria are also used to treat lupus erythematosus [6] (which is partly caused by an autoimmune reaction to sunlight) [3] and to treat muscle cramps (caused by pH and salt imbalances, and physical strain) [6].

Summary

Sun/stress related occurrence of malaria in individuals through the centuries supports a germ-terrain etiology of malaria.

Therapeutic History Validation

The terrain theory is the theory of disease proposed by Antoine Béchamp that a diseased body, the "terrain", will attract germs to come as scavengers of the weakened or poorly defended tissue. Béchamp believed that the pH of the body is important, and that an acidic pH will attract germs and an alkaline pH will repel them.

In modern science, germ theory as developed by Louis Pasteur has been the scientific consensus for many years. Germ theory states that microorganisms, bacteria, virus and fungi, are the cause of most diseases. It is the cornerstone of modern medicine and treatment of disease.

Centuries before the invention of the microscope, Hippocrates, the father of medicine, described malaria.

Before the modern era, the first ever test to distinguish malaria (then called ague) from other fevers was devised-a reaction to *Cinchona*. This was in effect a crude pH test. *Cinchona* [3] (from which quinine [6] is derived is an alkaloid (and alkaline) drug.

ALL the drugs used to prevent and treat malaria are alkaline in nature (i.e., pH >7). The anti malarial drug proguanil (paludrine) [3] is alkaline with a ph of 11.15 [3,14].

Chloroquine fights malaria by attacking the acidic part of plasmodium with alkalinity (in effect a pH war).

By the way chloroquine is the most used malaria drug ever. Quinine *pKa* = 8.56 at 25°C. Quinine reacts with acids to form salts (a characteristic of alkalines. pH of saturated aqueous solution of quinine = 8.8. Most alkaloids [6,3] are weak bases. Pyrimethamine (daraprim) used to prevent malaria is also alkaline [15].

Summary

Through the ages, the drugs utilized to prevent and treat malaria encouraged alkalinity of the body cells. This mode of therapy agrees with the germ-terrain duality of malaria.

Conclusion

Etiology, epidemiology and therapeutic history of malaria validate germ-terrain duality and the postulates thereof.

References

1. Ayoade S (2017) Germ-terrain duality of sickness, equivalent of wave-particle duality of light for the biological sciences? Int J Anat Var 10(1): 10-11.
2. Tindall B (1996) Bailiere's nurses' dictionary (22nd edn).
3. Oxford Minidictionary for Nurses (2003) Oxford University Press, (5th edn), New York, USA.
4. Chambers's Encyclopaedia International Learning Systems (1970) London, United Kingdom.
5. www.bbc.co.uk/history/ancient/romans/malaria_01.shtml
6. Soper R (1997) Biological Science (3rd edn), Cambridge University Press, UK.
7. Cobb JP, Hotchkiss RS, Karl IE, Buchman TG (1996) Mechanisms of cell injury and death. British J Anaes 77(1): 3-10.
8. Paddock C (2010) Tobacco smoke causes immediate damage to cells and tissue. US surgeon general, United States.
9. Waller H (1873) The last journals of David Livingstone in Central Africa, from 1865 to his death, continued by a narrative of his last moments and sufferings, obtained from his faithful servants Chuma and Susi. London, UK.
10. Clarke WH (1858) Travels and explorations in yorubaland, Ibadan University Press, Nigeria.
11. Ajayi S (1971) Yoruba warfare in the 19th century. Cambridge University Press, UK.
12. Dyess WD (2016) The Dyess story, eye witness account of the death march from Bataan and the narrative of experiences in the Japanese prison camps and of eventual escape of Lt Col WE Dyes, Putman. New York, USA.
13. Srinivas P (2015) Malaria in wars and victims.
14. https://www.ebi.ac.uk/chembl/compound/inspect/CHEMBL1201059
15. http://pharmacy.nova.edu/Pharmacodynamics/Modules/AcidsSaltsBases/Main_P5.html