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Review Article

Louis Pasteur Revisited: A Rebuttal to the Germ Theory of Infectious Disease and its Relevance to the COVID-19 Pandemic

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Abstract

Pasteur's theory of infection is a cornerstone of Western medicine. Here we propose a new approach that the proliferation of microorganisms in infectious diseases is encouraged by chronic stress-induced imbalances in the host that suppress both the immune and the digestive systems. Nature's method of controlling microbial growth uses quorum sensing inhibition, which disrupts the essential molecular signaling between microorganisms. Signal molecules produced by bacteria allow the pathogens to coordinate their behavior, and after reaching a threshold level, stimulates them to activate their virulence genes. However, the resulting infectious disease can be interrupted and even prevented by suitable, mainly hydrophobic quorum sensing inhibitor molecules present in a variety of common foods and spices. When a host's metabolic reservoir is enriched with these plant-derived inhibitors, infectious disease cannot develop - even if pathogenic microorganisms are present. In addition, these same bacterial inhibitors are also potent immune stimulants which can help reverse immune suppression. Microbes are not solely causative in the disease process, but merely opportunistic parasitic organisms, whose proliferation can be suppressed by resupplying the body with the necessary quorum sensing inhibitory nutrients. This observation challenges Pasteur's theory, and provides a straightforward alternative to Western medicine's antibiotic and antiviral-based microbial control methods, while also questioning the rationale for vaccination.

Keywords: COVID-19; Pasteur's theory; Infectious diseases; Vaccination

Introduction

The corona virus pandemic of 2019-20 has highlighted the inability of Western medicine to handle both local and global epidemics. The reasons for this failure can be found both in its theoretical and empirical approach to disease.

The presently accepted infectious disease theory originates in the 19th century and is credited to Louis Pasteur, French chemist. Pasteur famously developed the "germ" theory of disease by first studying fermentation and proving that microorganisms were involved in the process [1]. This later led to his understanding that diseases were associated with the activities of microorganisms. His subsequent research on chicken cholera and anthrax led him to the development of vaccines against these diseases using attenuated microorganisms. His promotion of vaccines was adapted as an integral part of Western medical thinking and practice worldwide.

Several of his contemporaries, the most famous of which was Antoine Bechamp [2], sided with a competing theory proposing that an imbalance or weakness in the internal state of the affected individual itself caused the disease, and that the microorganisms present are merely parasitic agents. We attempt to cast a new light on this debate in the context of modern scientific observations.

The Model

It is well known that chronic stress causes measurable physical manifestations which involve the activation of the hypothalamic-pituitary-adrenal axis leading to the secretion of glucocorticoid hormones (GCs) [3]. If the stress response persists, chronic GC stimulation of the nervous system, immune system, digestive tract and several organs leads to severe dysfunction in multiple organs and tissues. The neuro-immune mechanism sustained and prolonged by chronic stress sets up chronic inflammation in humans.

When the glucocorticoid-induced apoptosis signaling pathway is activated in lymphocytes, lymphocyte numbers drop dramatically [4]. As a result, cell debris appears in the circulation, and cell-free (cf) DNA is a marker of this debris. The appearance of cfDNA in the host correlates with tissue injury, and also correlates with the presence of viral or bacterial DNA [5].

Bacterial growth is limited by the availability of nutrients. Cell debris provides ready nutrients for multiplication. Current thinking on infection suggests that host tissue damage is simply a consequence of infection. We propose the reverse: nutrients from damaged host cells provide the signal for opportunistic bacteria to multiply and feed on damaged human tissue; therefore, "infectious" microorganisms are not essentially causative to the disease, but rather exist as an opportunistic parasite.

The infectious bacteria also receive growth-inducing stimuli by the same stress hormone signaling pathways (e.g., Cortisol) that

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simultaneously deplete the immune system [6-8]. Catecholamine stress hormones have growth-inducing effects, too, reducing the infectious dose of *Clostridium perfringens* by four logs in the presence of therapeutic levels of adrenaline [9]. These observations demonstrate how microorganisms exploit host weaknesses through an intersection between endocrinology and microbiology.

It is known that infectious microorganisms can be cultured from the body fluids of asymptomatic hosts [10]. So the host-microbe interaction can be subtle, and challenges the prevailing Koch's postulate that an infectious microorganism must not be found in unaffected individuals. This also undermines the pathogen-centered infectious origin of disease concept.

The human body contains a vast pool of microbes; the number of bacteria in the system exceeds that of the host's own cells by tenfold. This begs the question: how can infectious microorganisms be present in the body without causing disease? The answer lies in the mechanism by which the Nature controls microbial growth. Pathogenic microorganisms communicate with signal molecules in a process called quorum sensing [11]. These molecules are called quorum sensing autoinducers, and their concentration increases with bacterial cell density.

When a critical bacteria number is reached, bacterial genes are activated that help colony members cooperate in a coordinated secretion of virulence factors. Gram-negative bacteria communicate (e.g., with N-acyl-homoserine lactone or Oligopeptide molecules) while Gram-positive bacteria employ e.g., furanosyl borate molecules [12]. Antagonists have been developed against quorum sensing signal molecules of both Gram-negative and Gram-positive microbes [13]. These are mostly hydrophobic molecules that likely block the quorum sensing signal *via.* hydrophobic interactions.

Interestingly, curcumin reacts with boron compounds present in the quorum sensing repertoire of Gram-positives, which explains the antimicrobial effects of turmeric [14,15]. Therefore, the historic and ample use of antimicrobial spices in tropical countries, both in cuisine and traditional medicine (e.g., Ayurveda) have served in preventing food poisoning as well as the development of infections. This is a demonstration of Nature's microbial control mechanism.

Hydrophobic substances capable of blocking quorum sensing molecules include many food, fragrance and essential healing oils, used both in culinary applications and indigenous medicines all over the world. These include coconut, olive, sesame, rose, lavender, cinnamon, eucalyptus, pepper, mint and clove oils, just to name a few. These are also used in the form of their original aromatic plants.

Fruits like blackberries, cranberries, vanilla, citrus, garlic, and horseradish, medicinal plants like ginseng, goldenseal, and betel nut, spices like rosemary, turmeric, cinnamon, and chili peppers all have Quorum Sensing Inhibitory (QSI) activity [12]. Garlic is a particularly potent QSI food, and garlic compounds like ajoene, alliin, allicin and diallyl disulfide have been identified as inhibitors [16-18]. When sufficient concentrations of natural QSI molecules are present in one's metabolic reservoir, the growth of pathogenic microorganism is inhibited. This explains how pathogens can still be isolated from the body fluids of healthy individuals.

Prolonged stress-induced intestinal inflammation profoundly affects the intestinal epithelium, microbiota, host-microbiota interactions and mucosal immunity [19,20]. As a result, both digestion and absorption are compromised. Mucosal inflammation leads to increased production of GCs, further taxing the body in an ever-worsening cycle of indigestion and malabsorption. The deficiencies in intestinal uptake diminish the supply of critical micronutrients (vitamins, minerals) for the body including nutrients having QSI activity [21]. Immune suppression combined with a depletion of QSI metabolic reservoir allow opportunistic microorganisms to proliferate, establishing the symptoms of infectious diseases.

We have outlined here a mechanism of developing an infection as a combined action of stress hormones on the immune system and digestive functions. This suggests that the Pasteurian theory of infectious disease takes into account only a fraction of the disease process as a whole. Pasteur's critics, primarily Bechamp, correctly asserted that an imbalance or weakness in the internal state of the affected individual causes the disease, and the microorganisms present are opportunistic parasitic agents, not agents causing the disease [22].

With this understanding, we can explain the Corona virus' role in developing respiratory disease. The corona virus binds to human alveolar cells through its spike protein, with a palmitoyl post transcriptional modification [23,24] essential to its binding to the host cell possibly by insertion into the cell membrane lipid bilayer *via.* hydrophobic binding. When the body has a full metabolic reservoir of QSI inhibitors (e.g., plant-derived oils), the palmitoyl group is blocked from binding to the target cell surface, and the infection is prevented. Therefore, replenishing the depleted QSI reservoir of the body is sufficient to block an infection or reverse an established infection.

Interestingly, natural QSI molecules are also potent immune modulators. Curcumin from turmeric activates both the cellular and humoral immune system (T cells, B cells, NK cells, dendritic cells, macrophages) and down regulates the NF-κB signaling pathway, thus inhibiting the secretion of proinflammatory cytokines, and chemokines [25]. Garlic-derived alkylthio compounds like alliin, allicin, diallyl disulfide, ajoene have potent QSI effects, while also stimulating both innate and adaptive immune systems [26-28]. They increase lymphocyte proliferation, modulate cellular immune responses (Th1 and Th2), inhibit NF-κB signaling and components associated with the proinflammatory state, and enhance antitumor immunity.

We report here that plant-derived bacterial quorum sensing inhibitors are also potent stimulators of the mammalian immune system. This indicates an intriguing cooperation between species vastly distant on the phylogenetic tree of life, and again underscores the significance of botanicals in medicine. Further research focused on this link would simultaneously solve two major medical problems: microbial control and immune deficiency.

Conclusion

Western medicine takes a "scorched earth" strategy in microbial control, using antibiotics and antivirals with a broad spectrum of undesirable side effects. These upset metabolic homeostasis by interfering with the gut microbiota. In contrast, mechanisms of natural microbial control are without harmful side-effects, and also restore compromised immune functions. We have shown that Pasteur's theory of "infectious" disease is erroneous. Pasteur's other legacy, vaccines, carry both short-term and long-term health risks and will become irrelevant with the availability of QSI supplements [29].

The reason why curative botanical therapies are excluded from Western medicine is that sadly, "curing diseases is an unsustainable

business model" [30-32]. The current medical business model is based on symptomatic therapies and the marketing of marginally effective drugs. When medicine is a nonprofit concern, the mission-distorting effect of the business "bottom line" is taken out of the picture.

Hippocrates, the father of modern medicine, stated: "Let food be thy medicine and medicine be thy food." It is now possible to confirm this statement by modern scientific research. Effective antimicrobial strategies must follow Nature's principles. We propose that a broad-spectrum antimicrobial QSI supplement should contain at least one spice and two plant derived oils. The Infect-Block tm formula which is now available to the public is minimally comprised of cinnamon, olive oil and peanut oil, suitable to control microorganisms in the digestive and excretory systems [33].

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