

## Of *Animalcula*, *Phthisis* and *Scrofula* Historical insights into tuberculosis in the pre-Koch era

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نظرة تاريخية عن السل في فترة ما قبل كوخ

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**T**UBERCULOSIS (TB) HAS OCCUPIED PRIDE of place throughout the history of disease as a scourge with an unparalleled impact on humankind in terms of morbidity, mortality and economic cost. Until Robert Koch's revolutionary elucidation of its aetiology in 1882,<sup>1</sup> this disease inspired awe, social stigma, a variety of wide-ranging but largely ineffective remedies, and even stimulated artistic fervour in prose, poetry and paintings. It therefore behooves both current and future physicians to look back, recognise and remember the multitude of individuals and disciplines that contributed to (and sometimes detracted from) the understanding of this disease, which was famously alluded to by John Bunyan in 1680 as "the Captain of all these men of death...Consumption".<sup>2</sup>

This article casts a spotlight on tuberculosis during the pre-Koch era, from its semantics and eponyms, to a host of individuals (acknowledged or forgotten) who form part of the narrative of this disease as either discoverers or sufferers. These glimpses of past eons, preceding Koch's landmark discovery of the tubercle *bacillus*, offer a deeper insight into the complex interactions between disease, discoveries and societal interpretations.

### Antiquity and Semantics

Tuberculous deformities and lesions have been identified both by macroscopic appearances and by molecular analyses in the spinal columns of Egyptian mummies from 2,400 BC.<sup>3</sup> The terms '*phthisis*' (Greek *phthinein*, wasting) and 'consumption' (Greek, to eat up or devour) typified a terminal

disease that caused a 'drying' or 'consuming' of the body. The hopeless prognosis of the disease prompted Hippocrates to warn physicians to keep away from TB patients so as to preserve their professional reputation! Franciscus dele Boë Sylvius (in his *Opera Medica* in 1679) and Richard Morton independently described '*tubercles*' (Latin *tuberculum* = a small firm nodule or swelling; a diminutive of *tuber*, potato).<sup>4</sup> In 1839, Johann Lukas Schönlein first used the word 'tuberculosis' in reference to this disease.<sup>5</sup> The term 'miliary' TB was derived from the appearance of 1–5 mm millet-like lesions visible in chest radiographs when there was disseminated involvement of both lungs. The Japanese refer to the disease by varying names: *kekaku* (tuberculosis), *rogai* (consuming and coughing) and *haibyō* (lung disease).<sup>6</sup> *Scrofula* referred to the enlargement of the tubercular cervical glands, but is often loosely used to refer to tubercular infections of other tissues, like the bones.<sup>7,8</sup> The degeneration of infected tissue into a cheese-like mass, 'caseation', became a byword in classical pathologic descriptions of the disease.<sup>9</sup>

### Eponyms, Euphemisms and Metaphors

The 'great white plague', as distinct from the infamous 'black plague' which also took its toll on the human race, is a metaphorical reference to the epidemic prevalence of TB in Europe between the 17<sup>th</sup> and 19<sup>th</sup> century, associated with inevitable mortality. We know now, of course, that the two diseases had only one common theme—bacterial

infection—and that they were vastly different in epidemiology and in the acuteness of clinical manifestations. At the same time, references to TB as the ‘King’s evil’ implied that the panacea lay in the healing powers of the ‘royal touch.’<sup>7</sup>

Anton Ghon (1866–1936), an Austrian pathologist, lent his name to the terms ‘Ghon’s focus’ and ‘Ghon’s complex’ (the subpleural primary pulmonary lesion in children and its draining lymph node, respectively).<sup>10</sup> On calcification, its radiological appearance is referred to as ‘Ranké’s complex’. Sir Percival Pott, a pioneering surgeon in 18<sup>th</sup> century England, described the *gibbus*-like deformity of collapsed adjoining tubercular vertebrae, which indelibly wrote his name in the annals of medicine when this deformity was eponymously named ‘Pott’s disease of the spine.’<sup>11</sup>

A tubercular granuloma in the cortex of the brain, which can rupture into the subarachnoid space causing tubercular meningitis, came to be known as Rich’s focus after the American pathologist Arnold Rice Rich (1893–1968).<sup>12</sup> The term *lupus* for the ulcerated tubercular lesion of the skin epitomises its wolf-like rapacity, virulence and its capacity for destruction.<sup>13</sup>

The occupational hazard of implantation-TB (*tuberculosis verrucosa cutis*) is exemplified by the term ‘prosector’s wart’ which could be acquired with equal ease by such diverse professionals as anatomists, pathologists, butchers or veterinarians.<sup>14</sup>

In the pre-antibiotic era, one of the life-threatening complications was massive haemoptysis due to the rupture of a pseudo-aneurysm of the bronchial or pulmonary vessels; this complication eponymously came to be known as Rasmussen’s aneurysm after Fritz Rasmussen, a Danish physician, described its appearance in 11 autopsy cases.<sup>15</sup>

## Pathophysiology and Clinical Manifestations

While Hippocrates considered TB a hereditary disease, Aristotle and Ibn Sina,<sup>16</sup> perhaps more accurately, ascribed it as being a contagion. The Republic of Lucca in Tuscany, Italy, issued an edict in 1699 that emphasised the infective nature of the disease, the need for notification and the disinfection procedures required for the mortal remains.<sup>17</sup> Centuries later, in 1546, Girolamo Fracastoro brought the communicable nature of the disease to

the forefront again in his treatise *De Contagione*.<sup>18</sup> Aetæus of Cappadocia provided grotesque, but accurate, descriptions of the physiognomy of a *phthisic* patient:

*Voice hoarse; neck slightly bent, tender, not flexible, somewhat extended; fingers slender, but joints thick; of the bones alone the figure remains, for the fleshy parts are wasted; the nails of the fingers crooked, their pulps are shriveled and flat... Nose sharp, slender; cheeks prominent and red; eyes hollow, brilliant and glittering; swollen, pale or livid in countenance; the slender parts of the jaws rest on the teeth as, as if smiling; otherwise of cadaverous aspect...<sup>19</sup>*

In 1720, long before the advent of microscopy and Koch’s visualisation of the *bacillus*, the English physician Benjamin Marten first raised the possibility of “wonderfully minute creatures”, *animalcula*, causing the disease.<sup>20</sup> The French physician, Gaspard Bayle (1774–1816) classified 6 kinds of pulmonary consumption: chronic ulcerative; granular; melanotic; ulcerous; calculous, and cancerous (corresponding to fibrocaseous; miliary; anthracotic; abscess; calcified lesions, and true cancers in modern terms, respectively).<sup>21</sup> His colleague, René Laennec, invented the stethoscope in 1816, which enabled the auscultation of the tubercular chest, anointing him as an authority on lung pathology and diagnosis. Inevitably, this contact with TB patients caused his demise at only 46 years of age.<sup>18,21,22</sup> He thus joined the ranks of many physicians who died after prolonged attendance on their TB patients.

## Epidemiology and Socio-Political Dynamics

In different eras of social evolution in Japan, groups susceptible to TB included upper-class young women, highly-talented young men (18<sup>th</sup> century) or female mill-hands (during the industrial revolution).<sup>6</sup> A well-known universal predisposition was crowded living in unhygienic surroundings, often, but not always, an accompaniment of poverty. More specifically, occupational lung diseases (silicosis) and metabolic conditions (diabetes) provided breeding grounds for the infection to thrive. Political movements were often founded on and contributed to denouncing ‘infection’ as the cause of TB. The syndicalist movement in 19<sup>th</sup>

century France, used the disease as a rallying point to call for shorter labour hours, which were held as the preeminent cause of the working-class' inability to fight chronic diseases.<sup>22</sup>

The clashes for supremacy of one aetiological theory over another can today be dispassionately resolved; the wealth of knowledge indicates that, in most chronic infectious diseases, nutrition, occupation, personal habits, hygiene and immunity are inextricably linked.

The telling adage that "history repeats itself" is evident in a recent commentary on the increased number of TB cases in London that points the finger at two populations groups: immigrants inhabiting boroughs with similar living conditions to Victorian England, and prisons with abhorrent environs. It warns of a resurgence of the 'white plague' in the absence of timely political and financial commitment.<sup>23</sup> Closely following these predisposed populations are victims of geopolitical circumstance or human frailties such as migrants, refugees, homeless people, drug users, and human immunodeficiency virus (HIV)-infected groups. All of this calls for socio-political action since it is certain that the end of the 'white plague' is nowhere in sight.<sup>24</sup>

## Treatment and Prevention

A variety of diets purporting to cure TB—including vegetables, fruits and meats—have been proposed by physicians throughout the ages. One 'cure-for-all-ills' was blood-letting, a practice that stood strong for centuries. As mentioned previously, in the 18<sup>th</sup> century the 'royal touch' of kings was touted as a panacea, with anecdotal success.<sup>25</sup> The first TB sanatorium was opened in 1854 by Hermann Brehmer in Görbersdorf, Germany (now Poland), after his own disease was 'cured' by a sojourn in the Himalayas.<sup>26</sup> Such incidents of recovery, after exposure to fresh mountain air, heralded a faith in sanatorium treatment that reigned supreme for centuries. The choices ranged from 'enjoying the mountain air' or 'taking the waters' at spas in Baden-Baden (Germany), Royal Tunbridge Wells (UK) and Kusatsu or Atami (Japan). Additionally, TB inspired a new wave of architectural (flat roofs and terraces) and furniture designs in modernistic housing, which allowed the victims and their healthy contacts the beneficial effects of sunshine and air.<sup>27</sup> Whatever the

benefits of the fresh air, such practices encouraged the isolation of TB cases that curtailed the human spread of disease, and provided better nutrition and closer supervision of the patients. Even today, when the 'specific' aetiological agent and its therapy have been known for more than a century, supportive measures like nutrition, hygiene and environment still play a vital conjunctive role in achieving a cure and reducing morbidity. Pneumothorax or *plombage* were surgical options deemed to give rest to the infected lung and allow it to heal.

## Artistic Romanticism versus Societal Demonisation

In the 18<sup>th</sup> century, a wealth of literature elevated the sick pallor of tubercular *facies* to a poetic and romantic condition. Victor Hugo's *Les Misérables* and Puccini's opera *La Bohème* depicted accurate portraits of consumptive characters. The delicate allure of these afflicted yet fair women imbued the audience with a morbid fascination for this incomprehensible and seemingly unconquerable disease. The victims of this slow death were considered to be 'redeemed' or 'condemned' by this fate, depending on whether society perceived them as innocent or evil. John Keats's tubercular affliction and his extraordinary poetic creations, were even attributed in some bizarre manner to an igniting of the mind while the body wasted of the disease.<sup>28</sup>

This glorification contrasted sharply with the social ostracism of entire families once the understanding of TB's communicable nature took root. The expulsion of the tuberculosis-afflicted Frédéric Chopin from Palma, Majorca (where he had gone to benefit from the fresh air), by an intolerant and fearful citizenry reflected the opposing views of aetiology within the continent. While Northern Europeans considered it hereditary, the South considered it contagious.<sup>29</sup>

King Tutankhamun, Emily Brontë, Elisabeth Browning, Anton Chekov, Robert Burns, John Keats, D. H. Lawrence and Frédéric Chopin are just a few of the hundreds of famous and talented historical figures whose extraordinary contributions to civilisation were cut short by consumption.

## Oblivion versus Stardom

In 1865, the French military physician, Jean-Antoine Villemin, demonstrated the contagious nature of the disease through his experiments on animal pathogenicity. However, his observations were doomed to obscurity because of vehement opposition by his vocal contemporary Herman Pidoux, who expressed disdain for a theory that challenged classic knowledge. Pidoux expressed fear for the social stigma that would victimise sufferers if this concept was allowed to take ground. The prevalent notions of epidemiology attributed 'consumption of the rich' to chronic diseases, laziness, flabbiness, overeating and ambition; 'consumption of the poor' was instead attributed to ignorance, overwork, malnutrition and a lack of hygiene. This contrasting list of habits and behavioural practices questions the veracity of the scientific enquiry that allowed it to stand ground. In 1882, Koch's brilliant exposition at the Berlin Physiological Society—endorsing beyond doubt his predecessor's often maligned 'germ theory'—secured his place in history. He thus received the recognition for endorsing Villemin's astute conclusions that was denied to Villemin himself.<sup>30</sup>

## The Germ Theory Proven: Koch raises the curtain

Koch's identification of the tubercle bacillus in 1882—an achievement for which he was awarded the Nobel Prize in Physiology or Medicine in 1905—and Koch's postulates became the gold standard for establishing a causal relationship between an infectious agent and the resultant disease.<sup>1,31</sup> That watershed discovery, and the rapid advances in diagnosis, prevention and therapy that followed over the next 100 years, deserve to be addressed in another exposition on the subject in a subsequent issue.

## Lessons from the History of Tuberculosis

This short history of TB in the pre-Koch era offers a panoramic view of an unenviable struggle in the understanding of a formidable infectious disease. Men of science waded through a jigsaw puzzle of facts and myths; ironically, many were 'consumptives'

themselves. Prosection procedures (regrettably, a dying practice today) and a study of pathological anatomy provided much of the wealth of knowledge of this period. The creative arts represented the public notions of the time regarding the disease, and many socio-political policies were themselves disease-influenced. Numerous contributions enhanced, and disputes enriched, the inexorable progress leading to Koch's landmark identification of the tubercle *bacillus*. However, there is no doubt that the knowledge of past experiences enlightens us to face yet unknown challenges in the future of medicine—because history often repeats itself!

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