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The quarrel between iatromechanists and animists about the cause of cancer: lymph's role in oncogenesis

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Summary

In the 17th century, iatromechanists based to the solidist theory for the lymphatic system and lymph established a new speculation for the essential role of lymph in oncogenesis, while animists gave their own views in relation to the cause

Introduction

In 1651, the great scholars, Olof Rudbeck (1630-1702), Thomas Bartholin (1616-1680) [1] and Jean Pecquet (1622-1674) [2] discovered the lymph and the lymphatic circulation. These two important findings changed all data on cancer until the birth of pathological anatomy in the early 19th century.

Medical mechanists against animists

In the meantime, René Descartes (1596-1650), in his turn, barged with the description of a rational universe able to operate according to purely mechanical laws, wanted to apply mechanics, physics and chemistry to anatomy, physiology and pathology. Therefore, the human body would be a machine created by God. This living machine would consist of a set of levers, ropes, pumps, liquor, weights, etc [3]. Such theories were called "solidists" and inspired the fledgling medical school of "iatromathematicians" or "iatromechanists" or "iatrophysicians".

Despite his faith in mathematics, Descartes abstained to approach the physiological topics of this quantitative point of view which could be applied to other scientific studies (Photo 1). This task was largely completed by the Neapolitan mathematician Giovanni Borelli (1608-1679) [4]. Under the banner of Descartes other illustrious doctors of the 17th century line of cancer. Gradually, with the rise of pathological anatomy, new more rational theories have emerged.

Key words: animists, iatromechanists, lymph, oncogenesis, solidists

up: Lorenzo Girolamo Bellini (1643-1704) and Giorgio Baglivi (1668-1707), who by studying the vital phenomena from the perspective of physics and by considering the vessels as hydraulic machines, contributed



Photo 1. The French philosopher and mathematician René Descartes.

enormously to the definition of the new image of cancer [5,6].

The ancients believed that scirrhosis and cancer were formed by the accumulation of atrabile. The atrabile (or black bile) was a hypothetical substance believed to be secreted by the adrenal glands and was considered to cause melancholy. Like anything unknown, the atrabile had this elasticity that permitted to comply with all the theories [7].

Faithful to the doctrine of Descartes, the 17th century solidists were searching for this fabulous humor and their investigations had an immense impact on the decline of Galen's authority.

Lymph at the origin of cancer

Lymph had a real existence. It had been seen and analyzed as much as chemistry permitted at that time. Physicians knew that lymph could coagulate under the influence of heat and it was given off foam when they were boiling the impregnated tissues. However, as the tumors in boiling water gave off the same foam, and no one yet knew that this foam came from albumin, which is present everywhere in the body, it was concluded that all malignant tumors were of lymphatic origin. It was a false assumption but for the first time in cancer research, a theory was finally based on an experimental seat [8].

To explain how the lymph becomes cancer, iatromechanists imagined that, as a result of physical or emotional trauma, certain functions of the "body machine" are changed, causing lymphatic stagnation in certain points of the body. Then a benign tumor is formed, the scirrhous (scirrhous cancer = carcinoma rich in fibrous tissue and poor in neoplastic elements). When this stagnation is prolonged or when the injured area is subjected to further trauma or prolonged irritation, the lymph is "depraved" and "degenerates", giving rise to cancer. It is worth mentioning that the term "degeneracy" entered in cancer's vocabulary in the 17th century.

The theory of stagnation and lymphatic corruption replaced the old theory of humors, substituting the atrabile with a less mythical humor. At least the yoke of the past was shaken and the experiment took over speculation. Perhaps this is the reason why the animistic theories of cancer failed [8].

At the time when the iatromechanists subjected the morbid phenomena to mechanics, a new school was born. In response, it would subordinate these same phenomena to impulses from the soul.

Georg Stahl (1660-1734) was a young professor at the University of Halle, who published a book where the animists' theories were formulated (Photo 2). According to Stahl, the breath of life depends on who directs and coordinates all acts, meaning the "soul". It is in vain that the Cartesians attempted to reduce the human beings and animals to simple machines, because the various parts that construct a machine have their own economy independently of any "rational soul".

In case that this soul is disturbed, there is a phenomenon of "plethora" (plethora for the ancient Greeks= overabundance of fluids in general) which is the source of all morbid conditions, including cancer [9].

The animism of Stahl spread at the University of Montpellier at the instigation of the chancellor Paul-Joseph Barthez (1734-1806) who taught that all life is the product of two elements: the "thinking soul" and "vital principle" [10]. The vitalism of Barthez will be adopted in the early 19th century by his student, the eminent psychiatrist Philippe Pinel (1755-1826) who speaks of "deposits of the vital principle" in each organ [11].

Animism (or vitalism) did not profoundly mark its century because, unlike solidism, it was too abstract and difficult in experimentation. Thanks to advances in endocrinology, it will be partially restored in the first half of the 19th century under the name "neovitalism" and now under the referred theory of "genome", whose deregulation is the cause of the uncontrolled development of cancer cells.



Photo 2. The outstanding chemist and physician Georg Stahl.

Pierre Dionis (1650-1718), professor of surgery and anatomy at the King's garden in Paris, wrote in 1707: "External causes of cancer... referring to a severe contusion, or a bruise, which permit to the lymph to stop in the mammary glands of women, to thicken it and acquire the acridity by his time. The main internal causes is the vice of liquors separated from a terrestrial and viscous blood, filled with acid coagulants which, forming obstructions in the glands, retains the lymph and expose them to corrupt the glandular substance which contains them" [12].

François Gigot de La Peyronie (1678-1747), Jean-Louis Petit (1674-1750) and François Quesnay (1694-1774) speak of "rawness", "concoction", "alcalescence", "acrimony", "depravity" and "fermentation" of this capricious lymph which turns into cancer whenever it chooses [13].

Furthermore, cancerology seemed to get lost in a swamp of barbarous epithets. But as the truth often remains in the shadows before bursting in the daylight, seemingly insignificant observations at the same time opened the way for greatest discoveries.

The carcinogenic theory of lymph to rationalize the doctrines

Since 1704, Alexis Littré (1658-1725) presented to the Academy of Sciences a thigh tumor and proved that it does not consist of coagulated lymph, but body fat. In 1709, he indicates this kind of tumors, which he declares benign, as the lipoma, but this term will become classic a century later. Under the mask of malignancy, several innocent tumors troubled patients and physicians. For example, it was thought that cysts could degenerate [14].

However, the great specialist in diseases of females, Jean Astruc (1684-1766), was seeing in all other varieties of cysts the work of stagnant lymph accumulated in distended vessels. Antoine Louis (1723-1792), anatomist and surgeon, permanent secretary of the Academy of Surgery, who wrote the surgical part of the *Encyclopedia* rejected this hypothesis in 1774, asserting that such growths are formed by condensation and discharge of the tissues. "The cyst", he writes, "consists of preexisting substance of the part... The membrane which makes this sac is not newly formed, as might be inferred from the theory of some writers on this disease" [15].

At that time the scrofulous tumors, also known as "scrofula" and also accused of degeneration, are in their turn a sentence of non-suit after an exhausting argument. In fact, since 1693, Dr. Houppeville denounced the confusion existing between two diseases of different origin, and, if we may credit his testimony, the public opinion followed him on this point. However these productions, of tuberculous origin, were located at the crossroads of all dangers in these lymph nodes, where the evil spirit has the strong tendency to deprave. It did not take more so that physicians were convinced of their cancerous nature [16].

Antoine Louis also deserves credit for having raised the ambiguity. More specifically, Louis in order to convince his colleagues put two tumors to boiling. One was scrofulous; the other was of scirrhous and cancerous origin. In the first case, he obtained a gelatinous substance, while in the second an albuminous froth. He concluded that the scrofula was formed of an amorphous gelatinous material, while scirrhosis and lymph cancers were composed of albumins: "Scrofula", he writes, "are formed of gelatinous lymph. They do not degenerate into cancer, which proves that their material is of a different nature from the one which forms the scirrhus. Tumors of the latter kind are produced by the albuminous lymph which is susceptible to a spontaneous movement (fermentation) by which it becomes alkaline and very corrosive" [17].

A century later, it was found that benign and fibrous tumors produce a gelatinous substance with boiling, while malignant tumors, richer in albumin, emerge albuminous foam as a result of the concoction. Lipomas, cysts and scrofula were also successively subtracted from the family of cancers. All other tumors remaining in the same group under the name of scirrhus or cancer had to continue to comply with the theory of lymph. Mastitis, adenomas and most benign tumors continued to have a bad reputation [18].

But why some scirrhous tumors did not evolve, while others degenerated into cancer? For what reasons certain tumors were malignant soon as they arise? No one knew anything, or at least they were content to evoke the vagaries of the lymph.

Conclusion

The 17th and 18th centuries are marked by great discoveries which contributed to the evolution of oncology. The discovery of the lymph and the lymphatic circulation has led to the theory of carcinogenic property of the lymph that has dominated for at least a century, being the triangular corner of oncology, until the appearance of histology and pathological anatomy in the early 19th century.

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