Galen

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Abstract
After Hippocrates, Galen was one of the most outstanding physicians of the ancient world. He was born in Pergamon in c. 131 AD, but soon upon completion of his medical studies he went to become physician-in-ordinary to the Roman Emperors. Being devoted to his studies, he made a lot of discoveries in the field of anatomy and physiology. In pathology, he based his ideas on Hippocrates teaching. In diagnostics, he examined pulse and urine. He wrote about 500 treatises of which only 117 writings have survives to this day. Galen's scientific achievements have contributed enormously to the development and progress of medical sciences. His authority was unquestionable in Europe for over 15 centuries. Galen died in Rome in c. 201 AD.

Keywords: Galen, ancient medicine, ancient medical schools, the Roman Empire

Next to Hippocrates, Galen was the greatest physician in antiquity. As a foreigner in Rome, and thanks to his unique personality, therapeutic wit, and studies, which allowed him to write numerous pioneering works, he has achieved a huge success. His publications drew unusual attention, similarly to the Bible, for more than fifteen centuries, while Galen himself had undisputable authority in his field of study. His achievements showed considerable progress in medicine when compared to the earlier times. Galen was the first who doubted that the body would malfunction without any damage to its organs. He has created a solid and coherent system of anatomy and physiology; however, it was based on false theories. In clinical practice, he enforced a rational and methodical approach, especially when it came down to diagnoses. However, he was still driven by philosophical principles, despite the medicine at the time being already free of such influence. And although he tended to scoff the Dogmatists, his own actions showed signs of fruitless dogmatism.

He was most probably born in Pergamon in the year 131 CE. The city, located in Asia Minor, was a thriving centre of economy and culture of the Hellenistic epoch. The teaching of medicine was growing by the temple of Asclepius. Galen's father, a man of higher education (he studied architecture, among other things), sowed a love for the Greek language and the aesthetics of shaping one's thoughts into speech and writing in his son. Following his advice, the young Galen took up mathematics and philosophy, especially Plato and Aristotle. In adulthood, he was known for his sarcastic wit towards his co-workers and colleagues, possibly inherited after his mother, who was supposedly mean to her servants. Having finished studying philosophy, and again directed by his father, Galen took interest in medicine. With the intention of expanding his medical knowledge, he travelled to Smyrna, Corinth, and Alexandria, where he stayed for many years. He studied anatomy in Egypt, learning inter alia about the bone structure. During his travels he also approached various diseases, the methods of curing them, as well as some little-known plants, minerals, and animals with potential healing powers.

Upon his return to his homeland, due to his qualifications, he became a physician of gladiators in 158. Taking care of his patients' health made him realise how impactful it is to have a rational and hygienic lifestyle. Through patching up people with major injuries he expanded his practical knowledge about anatomy, as well as capabilities of treating fractures and the effects of physical damage to the body. However, his practice in Pergamon was not enough for his intellectual and professional ambition. Thus, in 163, during the rule of Marcus Aurelius, he travelled to Rome, where he quickly drew a lot of attention and achieved a great success. There, independently of giving therapeutic advice, he taught anatomy and physiology, and performed autopsy on animals, in public. His circle of friends, at this point, included members of the city's elite. In 165, he suddenly left the city, which was in the proximity of the plague reigning the Italy at the moment (the Antonine Plague). He supposedly aimed to escape the dangerous illness. Another hypothesis claims he left in the fear of his former friends' hostility, as he had been rude to them on numerous occasions. He went to Campania, then to Syria, Phoenicia, Palestine, and Cyprus, learning about new remedies at each place. His fame brought him back to Rome, in 168, by the order of Marcus Aurelius himself, an emperor, an intellectual, and a philosopher, who treated the physician with care and kindness. However, Galen was reluctant towards the idea of joining the royal following on a military campaign. Instead, he desired to look after the emperor's ill son, Commodus. In the following years, Galen served as a personal doctor to the

next emperors, Septimius Severus and Caracalla. He died in Rome in 201 CE [1].

As mentioned above, Galen was not a pleasant man and showed to be malcontent. He used to boast about his achievements, but at the same time did not seem to enjoy his life in Rome. He also tastelessly mocked his rivals and their beliefs, should they disagree on anything. He was a menace to his colleagues, calling them out for being ridiculous, superficial, or mad, sometimes even referring to them as "wandering jesters." Yet despite that obvious folly, he had an extraordinary mind and a solid and vast education, as well as a true talent, at work and science both. Thanks to such qualities, he was able to produce an outstanding amount of circa 500 texts, 117 of which had survived to the present day. Most of his works regarded medicine, but 125 of the texts did not. He also engaged in philosophy, geography, mathematics, rhetoric, and grammar. His most notable works include: *Of the uses of different parts of the human body*, an anthology composed of 17 tomes, in which he presented his views about anatomy and physiology; *On the parts affected by disease*, in which he described a location of a disease in relation to its diagnosis; *Of different sects in medicine (On sects)*, a book meant for students; *Of the method of curing diseases*, together with the compendia *Ars medica* and *Ars parva*, in which he wrote about medicine as a system [2].

Galen was an Eclectic. Officially, he was above various schools and cults, but in truth, he was happy to use the knowledge gathered by the Methodists, the Dogmatists, and the Pneumatics, at the same time being extremely critical of it. Only the teachings of Hippocrates met no doubts from Galen, who was always eager to preach them. He shared the sentiments of the school of Cos concerning Hippocratic theory on medical pathology, i.e. the view on the existence of the bodily fluids, their secretion and excretion determined, among others, by "critical days" and "favourable days". He described said views in one of his treatises – *Commentary*, which was a commentary on Hippocrates' *Epidemics* book. He paid similar attention to Erasistratus and Asclepiades, the latter of whom thanks to his teachings about atoms. He, however, accusedthe Alexandrian school and the Methodists cult of undermining and "breaking off" from Hippocrates' teachings. According to Galen, the two medical schools did not take into account the four classical elements and their properties described by Empedocles, and their representatives were not convinced of the humoristic theory on the causes of illnesses. They also doubted in the therapeutic qualities of nature, while Asclepiades claimed that the reaction of fluids present in bodies is the consequence of medicine abuse [3].

Galen based his philosophical views mostly on those of Aristotle, believing in the occurrence of purposefulness in nature. In that way he understood anatomy and physiology, claiming, among others, that the "creator" bestowed certain capabilities upon organs of living creatures, which allow them to fulfil their functions in an ideal way. He conveyed his teleological convictions in the already aforementioned work *Of the uses of the different parts of the human body*. The outstanding physician and scholar believed in a dualistic view of the world, in which he distinguished two competing factors: material and spiritual. Galen's medical views were also inspired by the philosophical output of Plato. He considered water, fire, air, and earth as the components of the human body, and believed that they transform in four fluids endowed with four qualities. These were: warm and humid blood, cold and humid phlegm, warm and dry yellow bile, and cold and dry black bile. The components mentioned were responsible for making up the human body. Human blood was the habitat of the soul, the forces of which controlled the entire body. The three basic forces of the soul expressed various functions of the organism: movement, warmth, and thought. Others symbolised the attracting and liberating, plastic, and auxiliary functions. In his works, Galen often talked about a "creator" or a "god" but not about gods in the pantheistic meaning. By doing so he attracted the attention and liking of theologians and Christian philosophers, who also adored his delight in the idealness of the structure and functioning of living beings, whose creation he bound to the dominance of a "higher reason" in the universe. We can say that Galen's uncommon intellect intuitively sensed the existence of God, whose presence was confirmed by the testimony of Jesus Christ [4].

The majority of the scientific research done by the Roman physician concerned anatomy and physiology. He based his anatomical studies on autopsies done on animal cadavers, mostly monkeys'. The results of his inquiries led to the obsolescence of ancient anatomical manuals written by Martial, Marinus, and Lycaeus. By making unauthorised analogies of the anatomy of animals and humans, he introduced into science many erroneous views, which were corrected in the 16th century mostly by Andreas Vesalius. He believed there existed small openings connecting the two chambers of the heart; he also did not discover the appendix, which is often absent in monkeys. He did, however, leave a detailed description of the muscles, ligaments, tendons, and skeletal bones. He extensively examined the muscles of the foot and hand. He divided the body into homogeneous parts, i.e. simple ones (bones, cartilage, muscles, nerves), and diverse parts, i.e. complex ones (liver, lungs, heart, etc.). He described the brain and its ventricles, spinal cord, and nerves, including the seven pairs of cranial nerves. He confirmed the difference between the sensory and motor nerves [5].

He also condoned physiological experiments to examine the functions of organs. For example, by cutting the spinal cord he caused the respiratory arrest, and by ligating the ureters, he found out that the urine was produced in the kidneys, and not in the bladder. By cutting different parts of the spinal cord, he was able to learn about the functioning of the cervical and intercostals muscles, as well as the diaphragm. He determined that blood flows in every vessel of the body. He considered the so-called natural warmth, i.e. "natural pneuma," as the core of life.

He assumed that the source of this warmth was the heart. The lungs, with their breathing mechanism, were supposed to cool the heart. For this purpose, the heart pumped the blood through the lungs, using blood vessels. The active phase of the cardiac cycle, i.e. the expansion of the heart, he named diastole.In this way, the heart sucks in the pneuma, which manifests as the pulse. He believed the arteries were filled both with blood and air, unlike Erasistratus, who thought they transported only the latter. The blood mixed with the "pneuma of life" in the heart and through blood vessels travelledto the peripheral parts of the body. The blood that partially reached the brain turned into the "spiritual pneuma" and was distributed throughout the entire body through the blood vessels. The nerves, which were distinguished from tendons in Alexandria, Galen called "soft nerves" in the case of sensory nerves, and "hard nerves" when it comes to motor nerves. According to him, both types of nerves contained an empty space, which was filled with "spiritual pneuma" responsible for lending mobile and pleasurable values necessary for all living beings, just like the light and warmth of the Sun. The organs, nerves, and pneuma were believed to lead an independent existence that conditioned the life of the entire organism. The stomach either accepted or refused the food. The kidneys processed the liquid substance and the spleen absorbed the remains of the liver products through the spleen vessels. The gallbladder absorbed the remnants of the bile liquid and possessed additional qualities, such as containment, processing, digestion, and excretion of substance. Galen was convinced that the liver is a final organs in the digestive track and that food gets there via the hepatic portal vein and partakes in the production of the blood from the "natural pneuma." All of the vessels transporting blood throughout the body were thought to originate in the liver. The blood arrives at the heart via the *vena cava*, where it mixes with the "pneuma of life." Galen was just as wrong about the function of the reproductive organs. He was of the opinion that the genitals located on the right side produce boys, whereas the ones on the left side produce girls [6].

In pathology, Galen promoted Hippocrates's humoral theory at the same time conceding with the Methodists' theory of methodologists' solidar pathology. He was an adherent of the so-called pathology of place, i.e. a belief that there are diseases restricted to one place only. He called the theory a theory of a change of sympathy. However, his interpretation of it was a bit convoluted. He wrote, for example, that intracerebral hemorrhage or stroke may be caused by a disease of the stomach, or that emesis may exacerbate a disease of kidneys. Hence an organ could be ailing because another organ was sympathetic towards it. The aforementioned explanation caused problems with determining symptoms of a disease.

When making a diagnosis, Galen relied on examination of the pulse and organoleptic evaluation of urine. The pulse was not particularly important to Hippocrates and his followers, but in Alexandria it was a subject of deliberation of Erasistratus, Herophilos, and Praxagoras. Among the authors who wrote treatises on pulse were: Erasistratus, Rufus of Ephesus, and Archigenes. Galen himself authored one of such treatises, in which he distinguished 27 types of pulse, e.g.: long, short, deep, empty, full, fast, soft, hard, regular, irregular and others. He used the examination of the pulse to identify malingerers [7].

Galen's choices regarding medications were not particularly original, and the same can be said about his opinions on the subject of diet therapy and pros and cons of different food items, which were similar to that of Pliny and Celsus. He advocated the use of many different therapeutic agents, which catered to the preferences of the common folk who wanted medicines (*populusremediacupit*). In his works, Galen listed 473 plant-based medicaments, used in the production of tinctures, extracts, decoctions, and other medicines. He also knew the composition of theriac (a panacea consisting of 12 up to 64 ingredients), and its uses. He promoted thought-out treatment based on medicines that had been tested and were appropriate to the nature of a disease and its causes. Galen's medical teachings also promoted beliefs that had very little to do with rationalism. Similarly, his diagnostic approach, which included interpretation of dreams and familiarity with "medical astrology," was terribly misguided [8].An inquiry into patient's dreams was one of the stages of clinical examination. Galen wrote: "The vision-in-sleep [*enhypnion]*, in my opinion, indicates a disposition of the body. Someone dreaming a conflagration is troubled by yellow bile, but if he dreams of smoke, or mist, or deep darkness, by black bile. Rainstorm indicates that cold moisture abounds; snow, ice, and hail, cold phlegm." He was of a similar opinion on the influence of stars and the Moon on the etymology and the course of diseases. He was convinced that zodiac signs determine the feeling of happiness [9].The position of stars enabled a physician to understand the symptoms and determine the right moment to administer medicines. If Galen had limited his treatment choices to Hippocrates's recommendations, his own discoveries in the fields of anatomy and physiology, as well as discoveries of the Alexandria School of Medicine in these fields, his contribution to clinical medicine would have been seminal and pioneering. Mixing the rational elements with the irrational ones and the renewed entanglement of medicine in philosophy was a step back in the development of ancient medical thought. However, we must remember that science in ancient Greece was in constant ferment and turning to the universe was the favorite spur and intellectual inspiration for the contemporary scholars, including Galen [10].

Galen esteemed his profession and advised doctors to prioritize honest, virtuous life over material goods. In his understanding, the meaning of life and the calling of physicians was doing good deeds for other people, and not the pursuit of riches. He expressed his opinions on the subject in his work *The Best Doctor is also a Philosopher*. This work is considered Galen's contribution to deontological ethics [11].

What made the influence of Galen's teachings persist for more than 1500 years? One of the hypotheses stipulates that the tumult felt by the people of the Christian and Muslim world made them seek support in indisputable authority figures. Galen was such a figure; his pedantic and dogmatic way of phrasing thoughts, convictions, and views left no room for hesitation or doubt. Additionally, the teleology of the Greek scholar corresponded to Christian beliefs. When in the Middle Ages the Church was laying the foundations of Christian civilization and culture, the works of Galen and other ancient Greek and Roman scholars were evident references to the antiquity, which served as an ideal and a source of inspiration. The process of shaping the new reality in connection with the legacy of classical antiquity lasted until 18th century, when for the first time an attempt to break a connection with the tradition of the Catholic Church and to undermine or eliminate the dominant religious worldview was made in France. And yet, such attempts had been preceded by the rapid development of sciences, including medicine, which spurred the realization that Galen had been wrong.

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Streszczenie

Galen był obok Hipokratesa najznakomitszym lekarzem starożytności. Urodził się w 131 r. w Pergamonie, ale po odbyciu studiów lekarskich przeniósł się do Rzymu, gdzie zyskał wielki rozgłos. Był lekarzem przybocznym cesarzy. Oddając się badaniom, dokonał wielu okryć w dziedzinie anatomii i fizjologii. W dziedzinie patologii opierał się na nauce Hipokratesa. W diagnostyce stosował badanie pulsu i moczu. Napisał ok. 500 dzieł, z których do naszych czasów przetrwało 117. Osiągnięcia naukowe Galena stanowiły ogromny postęp w zakresie nauk lekarskich. Jego niepodważalny autorytet w Europie trwał ponad 15 wieków. Zmarł Galen w Rzymie w 201 r.

Słowa kluczowe: Galen, medycyna antyczna, antyczne szkoły medyczne, cesarstwo rzymskie