12. POOL R., *Dialogue and the interpretation of illness. Conversations in a Cameroon village*. Oxford, Berg, 1994.
13. Il *kwashiorkor* è una sindrome, rilevata per la prima volta in Ghana nel 1933, che colpisce i bambini in tenera età e probabilmente legata ad una malnutrizione proteico-calorica.
14. Ma non va però dimenticato che anche una patologia per noi, ricchi occidentali, tutto sommato banale come la diarrea infantile è in questa parte del mondo, povero perché sfruttato, ancora in molti casi letale.

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MEDICINA NEI SECOLI ARTE E SCIENZA, 13/3 (2001) 509-521
Journal of History of Medicine

Articoli/*Articles*

MEDIEVAL ANDROLOGY AND THE PSEUDO-GALENIC *DE SPERMATE*

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SUMMARY

MEDIEVAL ANDROLOGY IN DE SPERMATE

The pseudo-Galenic De spermate, *a theoretical treatise on reproduction that was probably translated into Latin in the early Salernitan period and remained influential throughout the Middle Ages, provides valuable information about medieval ideas concerning the male reproductive system. The emphasis is on reproductive physiology. The text describes semen as a fluid that is originally drawn from the four bodily humours, primarily blood, is turned into sperm by coction in specific veins and arteries, and passes through the man's body along spermatic vessels, first ascending to the head and from there descending through particular organs to the testicles, where it is finally made complete for emission. The text also contains a description of male reproductive anatomy, including the internal structure of the testicles. Male reproductive pathology is not explored in any detail in this theoretical account, but a few potential problems in reproductive functioning are mentioned in the discussion of physiological processes.*

Introduction

The pseudo-Galenic treatise on human generation discussed in this chapter was widely disseminated in medieval Europe and exerted considerable influence on ideas concerning reproduction throughout the Middle Ages. In Latin primary sources the text is found under various titles: *De spermate*, *Microtegni*, *De XII portis*, *De XII signis*, or *De humana natura*[1]. Despite the most common and the best-known title *De spermate*, which to a modern reader suggests a focus on one single aspect of male repro-

Key words: Medieval andrology - Semen - Pseudo-Galen - De spermate

ductive system, the text also addresses other topical questions in human reproduction: conception, fetal development, polyembryony, sex determination, and the connection between the body and the soul. The specific contribution of the text to contemporary reproductive theory was, however, its long and sophisticated account of heredity, where parental physiological factors and astrological influences are woven into a fine-grained hierarchical system of determinants governing anatomical, physiological and pathological qualities of the offspring. On many of the points addressed, the text offers a synthesis of a number of earlier theories, and further combines them with astrological considerations, which became increasingly important in later medieval scientific theory and medical practice[2]. Synthesising also becomes a weakness of the text, because at some points it seems to have led to inconsistencies in theory, for example on the question of the constitution of semen and on some issues concerning heredity.

In the following sections, I will first briefly introduce the history of the text and discuss its contents in as far as they contribute to our understanding of medieval knowledge of the male reproductive system – its structure, function and dysfunction. As the text belongs to the natural-philosophical tradition of writing rather than the strictly medical one, its approach to reproductive functioning is entirely theoretical and does not extend to issues concerning sexual practice or sexual hygiene[3]. From the point of view of andrology, the focus in *De spermate*, is on male reproductive physiology: on male generative fluid, its origin and constitution, and its passage through the male body. Much about the anatomy of the male reproductive apparatus also becomes clear from the discussion of physiology. The discussion of male reproductive pathology or etiology is limited to a few scattered remarks on potential problems mainly related to physiological processes.

Text

The origin of *De spermate* is not known. It may have been composed in late Antiquity and transmitted to the Latin West through Arabic, but an Arabic origin is also possible[4]. At some stage the

text was falsely ascribed to Galen. The confusion is understandable in view of the fact that Galen had written a treatise on semen, *Peri spermatos*, consisting of two parts[5]. Galen's authentic text was translated into Latin in the fourteenth century by Niccolò Reggio and occurs in Latin manuscripts also under the title *De spermate*. In modern scholarship Galen's text is commonly referred to as *De semine*, but sometimes even today the titles *De spermate* and *De semine* occur for both texts, which continues to create confusion. It has also been suggested that the text in focus here is a deliberate forgery produced in the hope of spreading ideas under Galen's influential name[6]. Be this as it may, the text seems to be a compilation based on several earlier sources, citing a variety of ancient medical and philosophical authors as sources of knowledge, including false references to works by Hippocrates and Aristotle[7]. *De spermate* also contains a general reference to Galen, but there is nothing in the contents to suggest that the author would have drawn his information directly from Galen's authentic text on sperm. Although on many points concerning the origin and constitution of semen the text takes a similar view as Galen in *De semine*, the range of topics addressed in *De spermate*, the arrangement of the material, the level of detail, and some of the views expressed on other topics, notably the anatomy of the womb, differ drastically from Galen's work.

De spermate was probably translated into Latin in the early Salernitan period when interest in theoretical medical and natural-scientific knowledge was growing in the West and translation and copying of texts on these topics began to increase. There is some evidence, although not conclusive, suggesting that this text was one of the works translated from Arabic by Constantine the African in the second half of the eleventh century[8]. The Latin text or fragments of it are known to survive in well over 30 manuscript copies from the twelfth to the fifteenth centuries, and in several early printed books produced in different parts of Europe. The textual tradition displays considerable variation, and all extant copies do not in fact seem to descend from a single Latin translation[9].

The large number of extant Latin manuscript copies surviving in university libraries and other repositories around Eu-

rope suggests that *De spermate* was widely known in medieval centres of learning. This is one indication of the important position that issues in human reproduction had in medieval intellectual enquiry. The most frequently asked academic questions on generation were concerned with male and female contributions in reproduction and with sex determination. Human generation attracted a lot of attention in the works of famous surgeons and learned university masters in medicine, including William of Saliceto, Pietro d'Abano, Taddeo Alderotti and Dino del Garbo, but the topic was also addressed with equal interest in natural-philosophical and theological traditions, for example in the works of William of Conches, Hildegard of Bingen, Albertus Magnus and Thomas Aquinas[10].

De spermate is also extant in a medieval vernacular: a fifteenth-century English translation survives in a unique copy in Trinity College, Cambridge, MS R.14.52, a medical and scientific compendium with a rare selection of medieval learning in the vernacular. In addition to *De spermate* the codex contains, for example, English translations of Constantine's *De coitu*, Nemesios's *De humana natura*, a commentary of Hippocratic *Prognosticationes*, and a set of texts connected with the thirteenth-century scholar Roger Bacon[11].

Origin of semen

The origin of semen was a question to which different answers had been offered by early Greek scientists, and the medieval accounts in general were a continuation and in many ways an amalgamation of these[12]. The early theories can broadly be classified into two. Encephalomyelic theories maintained that semen originated in the brain and spinal cord. This notion was generally superseded by the pangenesis theory, which described semen as a secretion drawn from all parts of the body. The process was initiated by the physiological disturbance and heat caused by sexual arousal. Some early texts combined the two theories. For example, the Hippocratic treatise *De genitura* maintains that the secretion drawn from all parts of the body is conveyed first to the spinal marrow, and in particular, material from the brain flows into the marrow[13]. In the course of the

twelfth century the concept of haematogenesis, the notion of blood as the source of semen, already expressed both by Aristotle and Galen and emphasised by Arab writers, became generally accepted[14].

De spermate presents its own amalgamation of earlier theories on the origin of semen. Information on the topic is contained in different sections of the text, and variation in terminology and some inconsistencies indicate that this information is collected from several sources. The physiological foundation of semen is established in the first words of the text:

> *"Sperma hominis descendit ex humore totius corporis." (C f. 233vb)*[15].

The next few lines add more information: semen is drawn from all parts of the body to the testicles and for this purpose has its own nerves and veins, which are distinct from those for processing urine[16].

> *"Hoc autem sperma habet neruos & uenas proprias attrahentes se a toto corpore ad testiculos ... Qui nerui & uene diuersi sunt a neruis & uenis urine." (C f. 233vb).*

With friction and heat in sexual intercourse these nerves and veins emit semen in the same way as smiting iron and stone together produces fire. The physiological nature of semen is specified by a haematogenetic theory: semen is made principally of the finer, less viscous part of blood. The supremacy of blood over other humours as a component of semen is later in the text confirmed by the observation that men who because of excessive copulation fail to emit sperm shed blood (see below).

After describing conception and the early phases of embryogenesis, the text returns to spermatogenesis again, adding some further details. This time no mention is made of any other component of semen except blood. According to the text, blood is turned into a hot and moist substance by a process of coction in the organs of sperm that are specified as veins and arteries but in this connection not defined or located more closely. This hot and moist substance is said to have the nature of phlegm, and as it is turned into sperm, it also nourishes the veins and arteries[17].

The process is compared to lactation, by which blood is turned into milk in the woman's breasts.

> *"Sicut enim uertitur sanguis in mamillam mulieris in lac per quandam decoctionem ita sanguis uertitur in stotore siron i. substantiam calidam & humidam habentem figuram flegmatis in arteriis & uenis ad nutrimentum earum." (C f. 234rb).*

In describing the passage of semen through a man's body, the text offers some more details on spermatogenesis, this time also connecting the marrow to the process. According to the text, sperm ascends to man's head through one vein; this vein receives sperm from four other veins, which receive it from veins coming from all parts of the body and from bones containing marrow. The four veins that lead sperm to the ascending vein are located as follows: one is close to the kidneys, the second close to the heart and stomach, the third in the chest close to the lungs, and the fourth close to the liver. This time there is no mention of the arteries, which earlier in the text were specified as the organs of sperm together with veins.

In the medieval polemic concerning female seed, *De spermate* follows Galen's view and recognises the existence of female seed that is separate from menstrual blood. The point is not actually discussed in the text as a specific issue as it is in many other contemporary texts on reproduction, and the first reference to woman's seed, also called sperm, is made at the beginning of the text in a manner that shows that its existence was taken for granted:

> *"Nota quod sperma uiri & calidius & fortius est spermate mulieris. (C f. 233vb)."*

There is no specific discussion, however, about the origin of woman's sperm. The initial words of the text refer to *sperma hominis* rather than *sperma uiri* and this may indicate that the seed of both man and woman is believed to originate in a similar manner in all the humours of the body, but it remains uncertain whether the rest of the process beyond that point is thought to happen in the same way in both sexes. Woman's

sperm is characterised in standard contemporary terms as colder and weaker than man's sperm and as a nutriment for man's sperm. With the exception of this general biased comment, the text grants an equal role to both seeds in the production of offspring.

Pathway of semen

The sperm that is received into the veins and arteries from different parts of the body has only gone through the first production phase and can be described as some kind of raw semen that needs to be purged and refined. This fluid has the same capacity to circulate as blood, its chief material, and it starts travelling through the man's body. The circulation of sperm is an unconscious process and does not, for example, cause any sensation of desire in the male. First the fluid ascends to the head through one vein. From there it descends to the testicles, through one vein and one artery to one testicle and through another vein and another artery to the other.

> *"the sperme therof ascendith to the hede and with grete subtilite of veynes and poores descendith from thens bi ij veynes and ij arterijs vnto the testiculis ... Forsoth if it may wele descende from the hede without any jmpedyment, it goeth dividyng hymsilf bi a veyne and an arterie to a testicule and bi another veyne and another arterie goeth to another testicle (T ff. 29v-30r)."*

On its way down, sperm runs through specific organs and in each of these acquires the nature of the humour that rules there – therefore a child later conceived of that sperm retains the nature of all the humours, although one of them will dominate. These are the same members that were earlier in the text mentioned in connection with the earliest phases of spermatogenesis. The quality of sperm also changes when it passes through these organs[18]. In the liver, where humour blood is predominant, sperm is made hot and moist. In the chest, where phlegm prevails, sperm becomes cold and moist. In the heart and stomach, dominated by red choler, it becomes hot and dry. Finally, the nature of sperm is completed in the kidneys, where it is made cold and dry like the prevailing humour, melancholy. Sperm then de-

scends to the testicles in order to be purged and completed. Thus, an active role in spermatogenesis is assigned to the testicles in this text as in Galen's reproductive theory[19].

Some details are given on the anatomy of the testicles. According to *De spermate*, the testicles have two nerves that extend from the collarbone to the lowest part of the body:

> *"Habent etiam testiculi neruos duos pendentes, & descendentes a principali osse colli, & fundamento corporis, per dorsum, & renes. qui nerui alios habent neruos coniunctos alijs ossibus totius corporis (G col. 136)"*

The internal structure of the testicles consists of four receptacles, called *panniculos* in Latin, apparently two in each testicle, although this is not explicitly stated. Two of the four receptacles have heat and humidity. The other two receptacles have acridity, which coagulates sperm. The assumption is that each testicle contains one receptacle of each type, although this is not explicitly pointed out in the text. In addition to this the text also refers to members called variously *semitoria* or *seminaria* in the different versions. It seems that the text used as the source for the Latin was at this point either corrupt or for some other reason difficult to interpret. The different Latin versions are all more or less confused, and the relationship of *semitoria* to *panniculos* on one hand and to the seminal veins and arteries leading sperm to the testicles on the other hand is not quite clear. According to some versions, *semitoria* and *panniculos* are the same four receptacles by two different names, whereas some suggest that these are two different sets of receptacles. Some copies even give the impression that *semitoria* is an alternative term for the seminal veins and arteries. The *semitoria* have two different functions: two of them are described as glands attracting and purging sperm, the other two as members retaining semen from the right side.

> *"...qui testiculi habent iiii^{or} panniculos quorum duo habent calorem & humiditatem, alii duo habent acutionem que acutio sperma adiuuat. Habent etiam iiii^{or} uasa i. supradictas uenas et arterias & iiii^{or} semmetoria i. panniculos quorum duo retinent rectum & uerum & naturale sperma ex recto, alia duo sunt adhene i. attrahencia & purgancia sperma. (M f. 232 rb)."*

After coagulation sperm is ready to be emitted. It is emitted – complete and animate – with friction and heat in sexual intercourse, mixes with woman's sperm, and is received with a spirit into the woman's uterus, where it begins to grow.

Problems in male reproductive functioning

Little attention is given in the theoretically oriented *De spermate* to reproductive pathology or etiology, but some possible complications in male reproductive functioning are briefly mentioned. One of these is assigned to excessive sexual activity: according to the fifteenth-century English translation *"men above maner vsyng Venus werkis failyng sperme sheden blood"* (T f. 30r) – a point that is mentioned in many early texts on reproduction.

One of the problems is specifically connected with semen's passage through the man's body and is supposedly caused by an obstruction, a common source of pathological conditions in general in early medical theory[20]. While descending from the head to the testicles – the text remarks – sperm sometimes obstructs the pores of the man's ears and nostrils so that he cannot inhale. This happens when a large amount of blood is mixed with sperm in the man's veins and arteries and expands the volume of sperm so that it cannot descend. The obstruction creates a pain in the man's jaws. This condition is called *lupus* or *strangulatio* in Latin, *liquoides* in Greek and *stranglyng* in English, with reference to a feeling of suffocation or asphyxia[21].

Accidental emissions caused by phlegm, one of the four bodily humours, are briefly mentioned at two points in the text. In the first case they are connected with the passage of semen through a man's body. According to *De spermate*, it is common that watery phlegm descends with sperm to the testicles. In the receptacles phlegm is turned into a vitalising liquid, which generates a sensation of itching and burning in the testicles, creates the desire for coitus, and is emitted uncontrollably, sometimes during sleep.

> *"Solet enim cum uero spermate descendere aquosum flegma quod ab illis retinetur & emittitur aliquando dormiendo aliquando uigilando qui semper liquescunt & ex liquore acuto testiculi magnum pruritum & ardorem recipiunt unde generatur uoluntas coeundi. (C f. 234rb)"*

The other cause of accidental emissions mentioned in the text is the man's basic physiological phlegmatic temperament: the text mentions *solutio naturalis* as one of the many diseases that a person conceived in an hour dominated by phlegm can potentially suffer from.

A temporary pathological imbalance of the humours in the body can also create problems in the male reproductive system. *De spermate* points out that the excess of melancholy in the man's body causes dryness in the kidneys and pain in the penis, and reduces the quantity of sperm. In this case the man is said to produce a discharge of feeble sperm in coitus.

Although problems connected with infertility as such are not discussed in the *De spermate*, a comment related to this is contained in the philosophical section of the text discussing the connection of the body and the soul. This comment provides an explanation for why conception does not take place every time in intercourse. Different views of philosophers concerning the emergence of the connection are mentioned: some philosophers say that a new soul is connected in sexual intercourse with sperm in the matrix, some say that it is connected with the child formed in the matrix. The explanation given by Porphyry, who is regarded as the main authority on this in the text, is that sperm is not always animate when it is discharged from a man: the soul is mixed with sperm only when it is decided by God that a child is to be conceived.

Conclusion

The pseudo-Galenic *De spermate* provides a theoretical account of reproduction with an emphasis on physiological processes. The discussion is based on earlier theories in ancient and Arabic sources and on many points the text presents an amalgamation of various existing views. For our understanding of medieval andrology, the main value of *De spermate* is its theoretical description of the origin and constitution of male generative fluid and its passage through a man's body. The description of male reproductive functioning is firmly rooted in the contemporary physiological theory of the four bodily humours, and issues concerning reproductive anatomy are discussed in as

much as they contribute to the understanding of physiological processes.

The translation of *De spermate* and some related texts into Latin in the early Salernitan period marks the beginning of an era when a theoretical approach to reproduction began to gain wider interest in the West. As we know, the topic became a major concern in academic discourse within medical, natural-philosophical and theological traditions. Despite the amount of energy devoted to theoretical questions concerning reproductive functioning in the centuries following the translation of *De spermate*, there was fairly little advancement in knowledge about the origin and constitution of semen as long as the theory of the four humours retained its position as the prevailing physiological framework. The modern era in male reproductive physiology, commonly accepted as having begun with Leeuwenhoek's discovery of motile spermatozoa in semen in the late seventeenth century[22], was still a long way off.

BIBLIOGRAPHY AND NOTES

* This article was written under the auspices of the Academy of Finland, project no. 46191.

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6. Kudlien argues for a possible origin in the Neoplatonist circles connected with the school of Alexandria, where some forgeries of Galen were apparently produced around the third century. The influence of Neoplatonism is evident in *De spermate*, especially in the lengthy *de anima* passage, which gives particular emphasis to Porphyry (c. 234 – c. 305 BC), one of the outstanding Neoplatonist philosophers, and to his *Isagoge*. See KUDLIEN F., *The Seven Cells of the Uterus: The Doctrine and its Roots*. Bull. Hist. Med. 1965; 39: 415-423.
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13. LONIE I.M, *The Hippocratic Treatises "On Generation", "On the Nature of the Child", Diseases IV"*. Berlin & New York, Walter de Gruyter, 1981, p. 1.
14. See JACQUART D., THOMASSET C., *op. cit.* note 12.
15. For manuscript sigla, see *op. cit.* note 9. In the examples, abbreviations have been silently expanded and capitalisation and punctuation have been modernised.
16. The coupling of the words for nerves and veins in this context creates a misleading analogy in their function and suggests that semen is drawn from all parts of the body through both nerves and veins. The same phrase occurs in this context e.g. in the Hippocratic treatises *De genitura* and *De natura pueri*. See LONIE I. M, *op. cit.* note 13, p. 105 .
17. In *De semine*, Galen points out that the semen that is being formed in the spermatic veins and arteries can be observed in dissections and that the semen thus produced serves also as nutriment for the veins and arteries. According to him, all veins and

arteries generate the semen-like fluid that is their nutriment. See DE LACY P., *op. cit.* note 5, p. 49.

18. Galen remarks that the convoluted course of the spermatic veins and arteries provides the time needed for the alteration. See DE LACY P., *op. cit.* note 5, p. 49.
19. According to Galen's *De semine*, the testicles generate the purest semen, whose quality, when transmitted to all parts of the body, causes masculinity in males and femininity in females. The testicles receive the semen generated in the spermatic veins and arteries and send it to the spermatic duct. See DE LACY P., *op. cit.* note 5, p. 49.
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