Origins of Renal Physiology (Dedicated to Carl Gottschalk)

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The Low Countries – 16th/17th Century

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Vesalius · Van Helmont · Urine analysis · Edema

Abstract
Andreas Vesalius and Jan Baptist Van Helmont are the two major personalities who contributed substantially and in a different way to the early development of renal anatomy/physiology of the 16th/17th century in the Southern Low Countries. The importance of A. Vesalius' publication *'de humani corporis fabrica libri septem'* cannot be overestimated. The kidney was an intriguing organ to Vesalius, the function of which he could not fully grasp. J.B. Van Helmont was the first to demonstrate the importance of the measurement of the specific gravity of the urine and relating it to physiological and pathophysiological conditions. He made accurate clinical observations supported by autopsy examinations concerning the role of the kidney in the generation of dropsy.

When analyzing the contribution of scientists to the renal anatomy-physiology of the 16th/17th century in the Southern Low Countries, two figures step forward: Andreas Vesalius and Jan Baptist Van Helmont (fig. 1).

According to Gottschalk [1] 'the great advance in our knowledge of human anatomy was provided in 1543 by Andreas Vesalius (1514–1564), with the publication of his "de humani corporis fabrica libri septem" (1543). Based on actual dissection of the human body its importance cannot be overestimated'. In contrast it is remarkable that a scientist such as J.B. Van Helmont is almost unknown to the general and scientific community. This text will focus on the view of Andreas Vesalius concerning the anatomy and physiology of the kidney, and the important contribution of J.B. Van Helmont in the understanding of renal physiopathology will be demonstrated.

Vesalius' View on Anatomy and Physiology of the Kidney

Vesalius' views are clearly exposed in the main section dealing with the kidney in his major book 'de Humani corporis fabrica Libri septem' (1543). In book 5, entitled 'Organis nutritioni', chapter 10 'de renibus' is entirely devoted to the kidney and consists of three and a half pages [2]. The chapter starts by describing the localization of both kidneys in the abdominal cavity. In the second part, Vesalius formulates his own ideas concerning kidney architecture and function. Furthermore, he dwells extensively and with passion on the misconceptions and misin-

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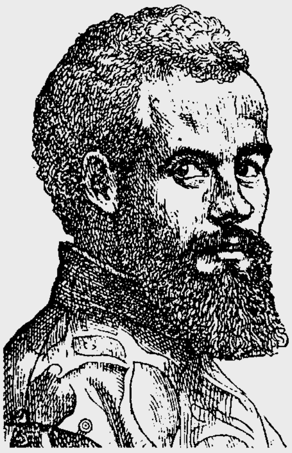


Andreas Vesalius	Europe - The World
	1438 Gutenberg makes first printing press
	1477 dead of the last Burgundian duke
	1492 Columbus-America / fall of Granada
	1498 V. da Gama in Calicut
1514 born in Brussels	1517 M. Luther - Wittenberg
1526 T. Moore "Utopia"	
1533-36 studied in Paris	1536 war between Charles V and François I
1537 graduated in medicine Padua	
1538 "Tabulae sex, Tabulae anatomicae"	
1540 public anatomy Bologna	1540 foundation of the "Societas Jesu" sj
1543 "De humani Corporis Fabrica" "Epitome" (Basel)	
1546 married to Anna Van Hamme	
1556 nominated earl	1556 abdication of Charles V ➔ Philips II
1564 died in Zante, Greece	
J.B. van Helmont	
1579 born in Brussels	1579 separation of the Netherlands
	1582 Gregorian calendar
1599 graduated in medicine in Leuven	1598 abdication of Philips II
1609 married to Margareta van Ranst	1615 G. Galilei in conflict with inquisition
	1619 J. Kepler "Harmonices Mundi"
	1620 F. Bacon "Novum Organum Scientiarum"
	1628 W. Harvey "De Motu Cordis et Sanguinis"
1634 conflict with inquisition / house arrest	
1644 "Opuscula Medica Inaudita" (Köln) Died in Brussels	1643 F. Torricelli invents mercury barometer
1648 "Ortus Medicinae" (Amsterdam)	1648 peace treaty of Munster
1659 "Dageraad ofte opkomst der Geneeskonst" (Amsterdam)	

Fig. 1. Time table of Andreas Vesalius' and Jan Baptist Van Helmonst's lives besides important events in their age.

terpretations of his contemporaries, concerning the kidneys (fig. 2A–C).

Vesalius makes short work, in more than clean wording, of the 'perforated membrane theory', the contemporary notion of his colleagues concerning the formation of the urine in the kidney (fig. 3A, B). For the demonstration of his own view on the anatomy and physiology of the kidneys, he used a dog kidney, which he considered very close to the human kidneys and moreover, having less fat, hence more useful to demonstrate that the 'sieve' theory of the urine formation was absurd (fig. 4, 5).

Vesalius also described 'two cavities which have been constructed by nature however in a totally different way from what the doctors think'. By repeating step by step the dissection of a dog kidney we tried to better understand Vesalius' views (fig. 6A–G).

The kidney was an intriguing organ to Vesalius '(quod incredible artificium ut videas') the function of which, particularly regading to the production of urine, he did not fully grasp [3]. 'It is the renal mass itself, which according to an inborn capacity and within appropriate and correct proportions ("ac propria ad iustitia temperie") will filter the serous drag out of the arterial and venous blood distributed over the renal mass and bringing the filtrate into the cavity, it will leave the kidney through the urinary conduct' [Fabrica, p. 516, lines 7–9].

A

maximè quum tot fabulæ de renum ofticijs, ſinibus, membranis, & quæ in renibus diſtribuuntur uaſis, antehac cæteris diſſectionis profeſſoribus efictæ ſint. Galenus inquit ſimpliciter, uenas ac arterias per renis corpus diſtribui, & per ſpiſſam duramq́ renum ſubſtantiam, retento ſanguine, urinam cum bilis quæ ſanguini adeſt portione tranſmitti, inq́ urinarium meatum effluere.

there are so many concoctions invented by professors of anatomy concerning the functions, structures, membranes and vessels splitting up in the kidneys. Galen claims that the vessels (vein and arteries) split up in the kidney mass where the blood is retained within the renal mass during which the urine together with part of the bile present in the blood is passed through and discharged in the urine.

B

Noſtrorum medicorum, & qui Galenum ſequuti ſunt omnium, hæc exprimere ſtudentium, alŋ perperam oſcitanterq́ renis fabricam aggredientes, & quæ hæc uaſorum ſit diſtributio & ſitus non obſeruantes, neſcio quas colatorias membranas ementiuntur. Alŋ ſectionem auerſati, & in altis cathedris ſedentes, ſibiq́ ipſis mirificè placentes Promethei, abundè ſuo munere ſe perfunctos eſſe arbitrantur, ſi diſcipulis imaginatione hominem cõfingant.

Our doctors, who follow Galen's ideas, describe however the structure of the kidney in an uncritical and false way. Where they do not take into account the distribution and localization of the vessels they invent many things, among them sieving membranes. Others, having an aversion to the practice of dissection sit on their high chairs, self-sufficient as Prometheuses and consider their assignment as fulfilled after having created a human body by means of their imagination.

C

Atq́ hinc illud eſt, quod præcipuos noſtræ ætatis medicos & docuiſſe & ſcripſiſſe ſcio, nobis triplicem, quo urina à ſanguine in renibus diſcernitur modum excogitari poſſe: non addentes interim, quid in ipſa hominis ſectione appareat, ſed ſibi ſinus & ductus ſuo arbitratu effingunt.

As an example, today's important doctors have taught and written that there is a threefold process in the separation of the urine from the blood. They do not argue based on what they observe by themselves dissecting a human body, but they invent, according to their own pleasure, cavities and tracks.

Fig. 2A–C. Extracts from Fabrica, pp. 515–516 (1543), with translation into English.

A

DVABVS præſentibus figuris medicorum de urinæ excolatione commentum exprimere conatus ſum, ac ſuperiori figura renem ab ipſius gibbo uerſus ſinum cauum uedißectum finxi, inferiori autem renis duntaxat media ſpectatur portio. Cæterùm quid ſingulis indicetur, ipſe characterum Index in hunc modum edocebit.

A Vena & arteria ſeroſum ſanguinem reni offerentes.

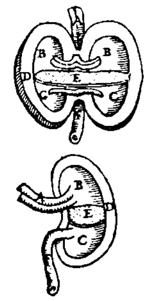
B, B Sinus, in quem medici uenam & arteriam nuper dictas ſero ſum ſanguinem profundere docent.

C, C Sinus, in quem urina ex iam dicto ſinu colaretur.

D Renis ſubſtantia orbiculatim ſinus hos amplectens.

E Beatum & nugacißimum renis colatorium, ſeu membrana cri bri modo peruia, & urinam ex ſinu B indicato in ſinum C in ſignitum unà cum bile promanare ſinens.

F Vrinam è rene ad ueſicam deferens meatus.



In those two figures, I have attempted to represent the false teaching ('commentum exprimere') of doctors on the straining ('excolatione') of the urine. In the upper figure, I have sketched the kidney dissected from its hump towards the sinus or hollow, but in the lower, only the central portion is seen. The other concepts will be indicated one by one.

A The vein and artery which brings the serous blood to the kidneys.
B The sinus in which the just-mentioned vein and artery let the serous blood flow, as taught by the doctors.
C Sinus, in which the urine from the aforementioned sinus is filtered.
D Circular renal mass which embraces both sinuses.
E A naive and ridiculous presentation of the kidney function as if the urine together with the bile is allowed to flow from the sinus indicated by B into the sinus indicated by C through a membrane behaving as a sieve.
F The excretory way towards the bladder of the urine leaving the kidneys.

B

Profectò ſagaciſſimus ille rerum Opifex tãtum munus uni membranulæ cribri modo perforatæ non tribuerit, neq́ in renibus eandem extruxerit.

It is obvious that the eminent Creator of the things has not assigned such an important function to that single thin membrane perforated like a sieve and that, furthermore, he never even constructed such a membrane in the kidney.

Fig. 3A, B. Extracts from Fabrica, pp 515–516 (1543), with translation.

Quod incredibile artificium ut uideas, caninum renem utpote macilentum, & nulla, quemadmodum humanus eſt, pinguedine oppletum, ad manum tibi eſſe uelim, illumq́ uti renis adminiſtrationem ad præſentis libri calcem ſubiungam, te primum aggredi. Poſt aliquot enim obitas ſectiones (dummodo prima non ſuffecerit) duos in renibus ſinus adinuenies, ſecus multo ac noſtri arbitrantur medici, à Natura formatos.

I suggest that, in order to understand this unbelievable masterpiece of nature, you take the kidney of a dog since it is lean and in contrast to the human kidney not covered with fat. Since after performing a couple of sections, in the case a first attempt would not be succesful; you will also find two cavities which have been constructed by nature however in a totally different way from what the doctors think.

Fig. 4. Extracts from Fabrica, p. 516 (1543), with translation.

Jan Baptist Van Helmont (1579–1644) – 'Doctrina, labor, disciplina'

Short Biography

J.B. Van Helmont (fig. 7, left) was born in Brussels (1579) and died in the same city on 3rd December 1644. At a very young age he went to the University of Leuven and followed the courses in the seven arts (magister septem artium). In 1599 he obtained his doctoral degree in medicine and was appointed as professor to teach the surgeons. He resigned very soon after, considering that he had only theoretical knowledge and dramatically missed practical experience.

From 1600 to 1602 he travelled through Germany, Switzerland and Italy and had his first contact with the scientific approach of Paracelsus (1493–1541), the founder of the iatrochemistry. Iatrochemistry or medical chemistry was the name given to the fusion of alchemy, medicine and chemistry, as it was practised by the followers of Paracelsus in the 16th and 17th centuries. This was an alternative to the new mechanistic philosophy, which eventually dominated modern science. According to this theory all expression of life and disease are based on chemical processes and diseases have to be treated by chemical way.

In 1609, J.B. Van Helmont married Margaretha Van Ranst. They settled in Vilvoorde, where Van Helmont

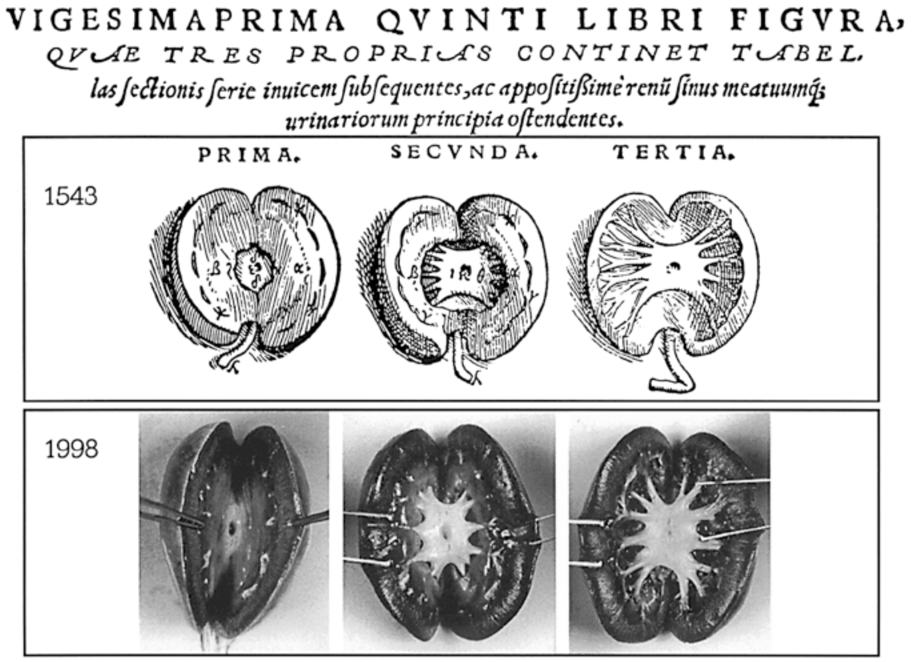
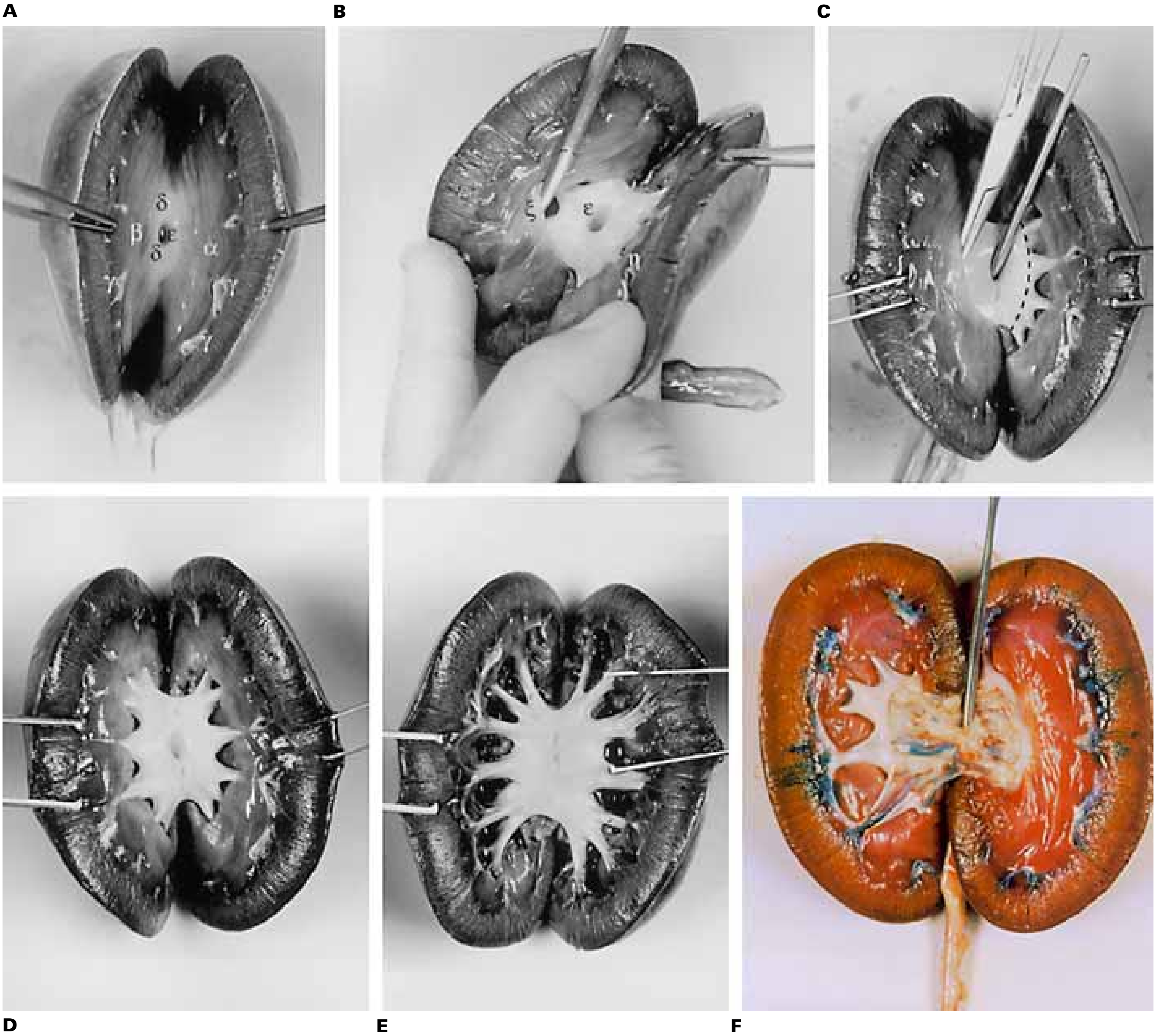


Fig. 5. Top panel consists in the original figures of Vesalius' dissection of the dog kidney (Fabrica, p. 371, 1543). The bottom panel is a careful dissection of a dog kidney performed according to the text in the Fabrica (p. 372), translated below (from *Prima*). The twenty-first figure of the fifth book consists of three small special plates which follow one another in the sequence of dissection and show very clearly the sinus of the kidneys and the origin of the urinary passage. *Prima:* The first figure demonstrates a section in the sense of the length of the kidney passing through its hump and deep enough so that the second cavity is attained in the absence however of ablation any part of the renal mass. The α indicates the anterior side of the right kidney, the β posterior side. The γ and γ are openings of the branches of the first renal cavity or the membranous body itself, where the different branches come together. Obviously, due to dissection, the branches are separated where they come together. The δ and δ mark the membranous body of the first cavity wherein the renal artery and vein end. ε Indicating the small hole is the origin of the urinary tract, λ is a piece of the urinary tract. On top of this membranous membrane, indicated by δ and δ, is situated the second renal cavity. In this particular dissection only the internal part close to the membranous body appears. The parts of this cavity formed at both sides from the partition out of renal substance and which cut the cavity in two parts, cannot be seen, except if a small instrument is introduced under the places indicated by ζ and χ. In this dissection this partition appears as separated in two parts, and anterior one and a posterior one indicated respectively by χ, and ζ. *Secunda:* Everything which has been mentioned in the first figure also holds for the second one, except that the renal mass, which constitutes this partition, has been cut circularly using a small scalpel. Here the complete second cavity of the kidney can be seen. However, not separated in two parts, since I have removed the partition which separates this cavity of her external side. The α, and the β, the γ and the δ, indicate the same as in the first figure, since the circle drawn between α and β indicates the second cavity of the kidney. The θ indicates indeed the anterior side of the first cavity or of the membranous body, where this part separates in different branches. The ι indicates the posterior part of this membranous body, consequently the θ and the ι together indicate the membranous body or the first cavity of the kidney. The χ indicates however the starting point of the urinary tract. *Tertia:* The third figure shows all branches of the first cavity or of the membranous body. Indeed, the renal mass, which merges with the terminal parts of the branches of this cavity, has been extensively removed. The figure speaks for itself without the help of letter symbols.

started building up a small laboratory. Van Helmont became increasingly dissatisfied with the bookish galenic medicine practised in the schools and eventually took up a career of private researcher. He performed numerous experiments in chemistry and studied thoroughly the texts of among others Paracelsus. His opposition to the established doctrines of medicine and to the medical teachings of churchmen (the Jesuit Jean Roberty) brought him in conflict with the Spanish inquisition, which badgered him throughout much of his life.

His most important writings were edited in 1642, in Antwerp: 'Febrium doctrina inaudita'. In 1644 in Köln appeared four combined texts: 'Opuscula medica inaudita de lithiasi, de febribus, de humoribus galeni et de peste'



G

Sinus hic inter diſſecandum ſubhumidus exanguiſq; omnino occurrit, corpus autem illud membraneum cum ſuis ramis omnibus, aut primus ſinus (ſi ita corpus id appellare uiſum ſit) ſanguine plenus ſemper inuenitur.

This (second) cavity seems somewhat wet and not containing blood, the membranous body with all his ramifications, so called the first cavity, is always full of blood.

Fig. 6. Dissection of a dog kidney according to Vesalius. **A** The dog kidney is incised longitudinally, through cortex and medulla, until a white membranous pouch is reached. In the middle of the white membrane, one can see the opening of the ureter (ε). The α marks the ventral side of the kidney, β the dorsal side. The first cavity described by Vesalius, consists of the white membranous 'body', together with its branches. γ and γ are the openings of the branches of the membranous body. These branches are obviously cut in two at the place where they come together during the dissection. δ and δ mark the membranous body of the first cavity. The second cavity described by Vesalius is formed by the medullary tissue on the one side, and the membranous body on the other side. This is illustrated on the next picture. **B** The instrument is placed in the second cavity. By lifting the instrument, the branches of the membranous body become clearly visible. The membranous body and its branches form the bottom of the second cavity. Above the tip of the instrument, one can see the medullary tissue with the papilla communis, constituting the partition of the second cavity. This partition is cut in two due to the dissection, with η indicating the ventral side and ξ the dorsal side. The urine comes out of the papilla communis, falls down on the branches of the membranous body, and is guided to the ureter (ε). **C** The gauging rod is inserted in the ureter. On the ventral side of the kidney, the papilla communis is excised (marked by the dotted line). **D** This figure corresponds with the second picture of Vesalius. The

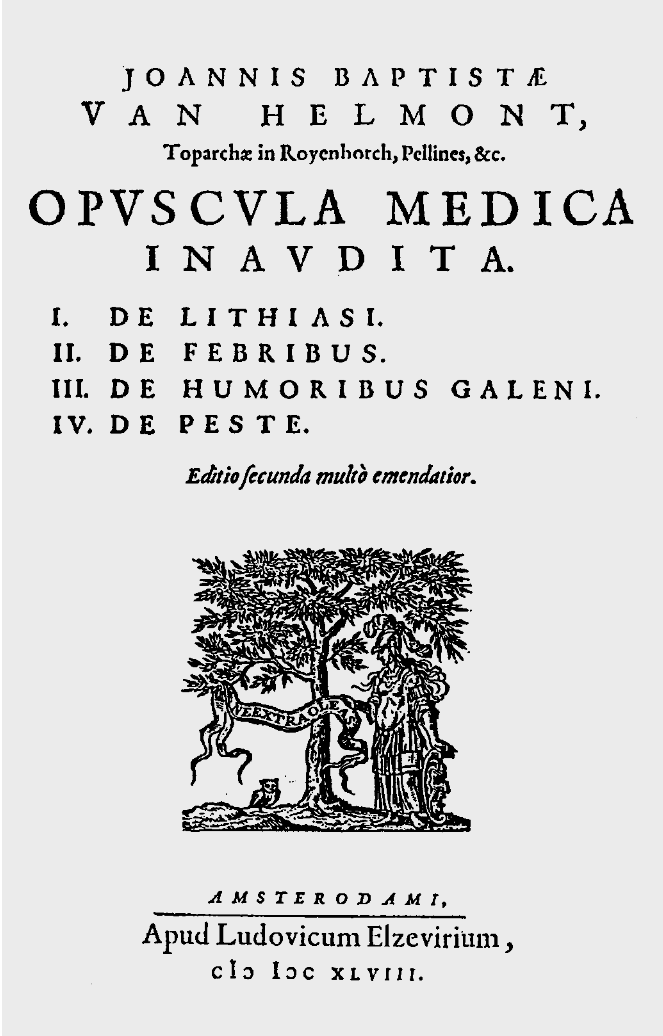
Fig. 7. J.B. Van Helmont and his son.

Ick ſchrijve dit in mijn vaderlandtſche tael, op dat mijnen naeſten in 't gemeyn daer af geniete, verſtaende dat de waerheyt nergens naeckter en verſchijnt, dan daer ſy van alle cieraet ontbloot is. Anderſins ſchrijvende alleen voor de Geleerden, ſtaet te beduchten, dat naedemael de letter opblaeſt, mijnen arbeydt mocht gedyen als in menige andere, alwaer de ſtrijdt-reden alles verſtroyt.

Joo heeft het my goet gedacht te ſchrijven in een ſpraecke, waer in de gemeynte my ten beſten verſtonde.

I write in my national language in order that my compatriots can use and understand easily and clearly the truth, which is exposed without any ornament. If I should have written only for the scholars, one can expect that my texts will be interpreted in a wrong way and will be diluted by many discussions. (-) Accordingly, it seems obvious for me to write in a language in which the common people can understand me.

Fig. 9. Extract from 'Degeraad ofte Nieuwe Opkomst der Geneeskonst', Amsterdam 1659, with translation.



JOANNIS BAPTISTÆ
VAN HELMONT,
Toparchæ in Royenborch, Pellines, &c.
OPVSCVLA MEDICA
INAVDITA.
I. DE LITHIASI.
II. DE FEBRIBUS.
III. DE HUMORIBUS GALENI.
IV. DE PESTE.
Editio ſecunda multò emendatior.

AMSTERODAMI,
Apud Ludovicum Elzevirium,
cIↃ IↃC XLVIII.

Fig. 8. Front page of 'Opuscula medica ...', Amsterdam 1648.

partition of the second cavity is cut away circularly. The membranous body with its ramifications is clearly visible. Within this first cavity the renal artery and vein branch and follow the ramifications of the membranous body. **E** This figure corresponds with the third picture of Vesalius. The medulla, connected to the offshoots of the first cavity, is entirely excised. As such, the three-dimensional aspect of the membranous cavity becomes visible. **F** The gauging rod is inserted in the ureter. The membranous body is opened, so that its two layers become visible. Methylene blue is injected in the arteria renalis, visualizing the ramifications within the branches of the membranous body. The blue pigment flows out of the opening of the branches (γ and γ) of the first cavity at the transition cortex-medulla. Hence, the membranous body is not a real cavity, but a bilayered membrane, in which the ramifications of the vessels run, and forms the bottom of the second cavity, thus forming an estuary guiding the urine to the ureter. **G** *De humani corporis fabrica* (p. 516, line 41, *Liber V* 1542), with translation.

(fig. 8). After his death in 1644 his son edited several of his texts written in Latin and Flemish. Among them is 'Dageraad ofte Nieuwe Opkomst der Geneeskonst' (Amsterdam 1659). In the introduction of this text, Van Helmont explicitly mentioned why he wrote in his mother language (fig. 9). At several places throughout the text he discusses the issue why he has chosen the Flemish language to explain his scientific findings. It is remarkable that at the same time several outstanding scientists in other disciplines than medicine in Flanders wrote their texts in their mother language (Simon Stevin, Mercator, Dodoens).

Van Helmont believed that the basic substances of the world were not the four elements of Aristotle and Galen, Tuta est interim methodus, examinandi urinas per pondus. Uncia nimirum, pendeat 600 grana. Vas autem vitreum habui, angusti colli, pendens grana 1354. Repletum autem aqua pluvia; pendente insuper grana 4670. Inventa est urina senis, pendere eodem vase, 4710 grana. Sive superare pondus aquæ pluviæ, 50 granis. Urina autem mulieris sanæ, ætatis annorum 55, pependit 4745 grana. Urina juvenis sani, annorum 19, pependit grana 4766. Alterius autem juvenis paris, abstemii à potu, pependit 4800 grana. Juvenis 36 annorum, tertianam tolerantis cum tussi, pependit 4763 grana. Præfatus autem juvenis 19 annorum, cum tertiana duplici, nocte præcedente, parum biberat: pependit autem urina ejus, 4848 grana. Quod fuit 82 granis amplius, quàm dum sanus esset. Virgo, cordis palpitationem passa, minxit instar aquæ pluviæ, quæque ideo æquiponderabat aquæ pluviæ. Urina tepens, semper se ipsa frigida, paucis granis levior, ut & extensior. Sitque idcirco vas colli brevis, & acuminati, ut fere in puncto urinam dimetiatur.

The method examining the weight of the urine is a safe one: one ounce of urine weigheth 600 grains*, but it had a glassen vessel of a narrow neck weighing 1,354 grains, but it was filled with rain-water weighing besides 4,670 grains. The urine of an old man was found to weigh in the same vessel 4,729 grains, or to exceed the weight of the rain-water 50 grains. But the urine of a healthy woman 55 years old weighed 4,745 grains. The urine of a healthy man of 19 years old weighed 4,766 grains. But that of another young man of a like age being abstemious from drink weighed 4,800 grains. The urine of a young man 36 years old, undergoing a tertian ague with a cough weighed 4,763 grains. But the aforesaid youth of 19 years old with a double tertian had drunk little in the night aforegoing, but this urine weighed 4,848 grains, which was 82 grains more than while he was healthy. A maid having suffered the beating or passion of the heart made a water like unto rain-water, and the which therefore was of equal weight with rain-water. A luke-warm urine is always a few grains lighter and also more extended than itself, being cold. And therefore let the vessel be of a short neck and sharp pointed that it may measure the urine almost to a point.

*20 grains weigh about 1 gram

Fig. 10. Extract from: Ortus Medicinae, Opuscula Medica Inaudita, II De Febribus, p. 108, 1648, Apud Ludovicum Elzevirium Amsterdami. Translation from: The evolution of urine analysis, Lecture Memoranda BMA meeting, p. 49, Birmingham, 1911.

nor the three principles of Paracelsus. Instead he thought that all matter was reducible to water. He had an ontological view on diseases. In it diseases are visualized as if they were real beings, objects that can be considered and classified like any other object. Such a view is in radical opposition to ancient tradition which in Van Helmont's time ruled absolutely in medicine [4].

J.B. Van Helmont and the Kidney

The contribution to nephrology of this gifted original scientist of the end of the 16th, early 17th century, is that he was the first to demonstrate the importance of the measurement of the specific gravity of the urine, and relating it to physiological and pathophysiological conditions (fig. 10).

Van Helmont introduced the concept of concentrated/diluted urine depending on particular clinical condition, based on simple experimental data he collected in patients and normal subjects. Van Helmont was aware of the fact that the temperature of the specimen (the urine) makes a slight difference in weight and insisted very strongly to use rain water as a standard weight for comparison with urinary samples.

The second contribution of Van Helmont to the renal physiopathology consists in his views on dropsy. The nature of dropsy by the galenic medicine of that time was unknown. One distinguished three types of dropsy: (1) anasarca or aqua intercus; (2) ascites, and (3) tympanitis or gaseous dropsy.

The galenic medicine was not making a clear-cut distinction between anasarca and ascites and attributed the primary cause of these clinical settings to the liver.

Van Helmont disagreed with this view.

It is true that the liver may, in certain conditions, be the starting point of dropsy, however, it will not occur if the kidneys are functioning sufficiently well. 'Adeoque non pecat hepar, generando urinam, quantum renes pecant, non emulgendo eam' [5].

Even the main cause for dropsy resides in the kidney instead of in the liver. 'Quapropter vitium potius in rene mihi subsistere visum, quam in hepate' [5].

He performed several autopsies of patients who died from ascites, without finding macroscopic lesions of the liver. An officer died of dropsy following dysentery and the liver appeared to be perfectly normal. The same was true for a young woman who died from dropsy associated with a gynecological pathology. He found, however, that the kidneys were decreased in volume, had a size of a hazel nut, in this dropsy patient. A banker died from dropsy. His kidneys were inflammatory and hardened. He claimed that this clinical condition does not go along with renal obstruction, but that the extravascular blood is the cause for this occasional hydrops. 'Obstructio renis non est causa occasionalis hydrops, set cruror extra venatus' [6]. He concluded that the kidney was the architect of dropsy: 'ren artifex hydropsys'. He observed that during dropsy urinary secretion is dramatically decreased and on the other hand if one is successful in increasing the urinary output one can see that there is a decrease in the dropsy.

How does Van Helmont interpret his observations of the role of the kidney in particular form of dropsy? Dropsy is a disease which starts by a depravation of the blood following an 'idea indignationis' induced by the renal archeus. Indeed, according to Van Helmont in the body the principal of life is the 'archeus'. Every organ has its own archeus. Disease acts by the 'idea indignationis' which makes the 'archeus' acting in the wrong direction.

Under influence of this wrong-acting archeus there is an obstruction of the renal circulation in the kidney. The blood undergoes some alterations in the kidney, which permits its fluid part to be discharged in the peritoneal cavity.

His view on this clinical setting was completely in contradiction to that of his colleagues. It is remarkable that this clinical scientist already at the beginning of the 17th century made clinical observations which were supported by autopsy examinations concerning the role of the kidney in the generation of dropsy. The kidneys in fact conceive, make and maintain dropsy 'renes actualiter hydropem concipiunt, fabricant et continent' [7].

The idea that at the beginning of the 19th century it had not yet been realized that there could be a causal relationship between kidney disease and dropsy, may be reconsidered [8].

References

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