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## Chemistry Around Medicine and Pharmacy in the Work of Amatus Lusitanus in the Sixteenth Century

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In the 16<sup>th</sup> century arose considerable chemical knowledge via Medicine and Pharmacy, which like today, are in very close contact. At the same time Chemistry joined the techniques and ways of thinking which helped it to develop in its own right a few centuries later.

Amatus Lusitanus (1511-1568) was a notable physician from the Renaissance, born in Castelo Branco/Portugal, who obtained a great reputation all in the Europe of his time. His work has many and interesting aspects on the beginning of Chemistry as associated to Medicine and Pharmacy. The collection of the seven *Medicinalium Centuriae*, written by Amatus Lusitanus, reunited an enormous set of episodes reporting medical situations, in which he participated, both those in which he succeeded and those in which he did not succeed. Described in detail and rigour, all the episodes demonstrate his meritorious human character as well as his technical expertise.

This descriptive study will be approached in five parts: in the first will be presented a brief description of the life and work of this important physician, reliving his troubled face travelling in renaissance Europe, in part due to his Jewish origin; the second aspect presented is the analysis made on the content of the first *Medicinalium Centuriae* (100 medical cases) highlighting organic (plant and animal origin) and mineral materials included in the medical prescriptions; in the third phase the laboratory techniques and operations in order to prepare the medicines are mentioned and briefly described; In the fourth part, aspects related with precision and rigour in the prescriptions, particularly in what respects measurements of the quantities used in the preparation of medicines, are evidenced. The thematic topic of weighs and measures was our main interest in the analysis recently made on the work of Amatus Lusitanus (Paixão, Jorge and Florido, 2005). In this context, were also developed a project with young pupils centred on

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the topics of precision and measures based on historical documents (Fradesso da Silveira, 1856), carried out to associate the history of science into primary and secondary school activities (Paixão et al, 2006). Other aspects of the work of Amatus Lusitanus, as described in his *Medicinalium Centiriae*, are also very appropriate to use in such activities for young pupils. Finally, is a discussion of the relations of Amatus Lusitanus with the ideas and theory of his time, especially supported by *Paracelsus*. All these interrelated aspects highlight the very beginning Chemistry, materialised in the applications and rigour required by Medicine and Pharmacy.

### The Physician of the Renaissance

The physician João Rodrigues de Castelo Branco (1511-1568) adopted the name of Amatus Lusitanus after he left Portugal in escaping the Inquisition which devastated the south of Europe at the time.

Their studies at the University of Coimbra, in 1529-1533 Amatus Lusitanus graduated in Medicine at the University of Salamanca, Spain, when he was 18 years old. After the graduation, he came back and travelled all over his country, prac-



**Figure 1.** The statue in honour of Amatus Lusitanus in Castelo Branco

tising medicine and searching for medicinal plants. It is well known that by the middle of the century he practised medicine in Portugal. Some of the reports in the *First Medical Centuria* report medical cases observed in his country. The absence of liberty caused by the Inquisition imposed him the precarious condition of being an exile in several countries of the Europe for the rest of his life. He never came back again to Portugal, but he never forgot his native country, adopting in his name a direct reference to the lands where he was born (*Lusitania*).

In 1534 he was in Antwerp practising medical clinic, but the Inquisition obliged him to change his work place. He went to Ferrara, where he also taught Medicine,

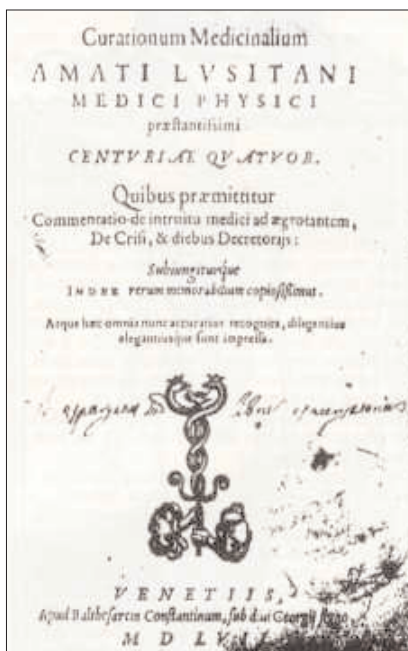


Figure 2. The title page of *Centuria*

staying there for 6 years. In the next three years he worked in Ancon and probably in 1551 he arrived in Florence. He practised medicine in several Italian States, and he went to Rome several times being asked by influential people. Again for religious motives, he took refuge in Ragusa (1558), and finally lived in Thessalonica. The plague spread in this region and Amatus Lusitanus involved himself arduously in his work trying to save people and lost his own life in 1568. Among his main books are *Index Dioscorides* (published in Antwerp 1536), *In Dioscorides Anabarzaei de Medica materia librum quinque enarrationes eruditissimae* (Venice 1553), *Curacionum Medicinalium Centuria septem* (Venice, between 1552-1559).

*Lusitanus* was the first to observe the valves of veins (1547) giving a valuable contribution to the study of the blood circulation and the *Pharmacopea Lusitana* (Santo Antonio, 1704) refers to him as a notable botanical observer and recorder, as well as an expert in the field of Pharmacy. The main work of Amatus Lusitanus was the set of seven medical *Centuriae*, which were not translated from Latin to Portuguese until the beginning of the 20<sup>th</sup> century (Pita, 2000). His clinical attitude was very relevant. As he declared: "As a physician I never abandon a patient despite I know that he will die, because some times occurred surprises (*miracula*) as I has verified some times" (Castelo Branco, 1552 [ed.,1946]).

Also meriting a great attention is the Medical Oath written in 1559 in Thessalonica. In this he reaffirms his great dedication to the patients, independently of economical power, social status or religion; for him all suffering people merited dignity, care and attention.

The physician began each episode in the *Centuriae* by a careful description of the case presenting the whole situation, a detailed diagnostic and the prescription, including the curative ingredients and the technical procedures to be carried out by the patient or by their accompanying person.

Amatus Lusitanus stated all the materials used, the operations needed for the preparation of medicines and the proper medical interventions as well as the precise quantities needed. The rigour and critical reflection about his decisions and results are their main scientific attributes. He observed the case until the end, death or health, reflected on and wrote about it, patiently reporting and collecting them.

Despite having been the physician of Catharine of Medici and of Pope Julius III he never discriminated anyone because of their origins or religion and he never forgot his birthplace making various references to it in his vast work. As a brilliant professional he gained the status of citizen of Europe.

### **Organic and mineral materials in the first *Curatium Medicinalium Centuria***

Plants are the most abundant materials used in the first *Curatium Medicinalium Centuria* of Amatus Lusitanus. Among these were: endive, chamomile, aneto, fennel yellow, flax, marjoram, penny-royal, roses, madder-plant, senna and violets. Despite that the Mediterranean flora were the most influential, there were references to some oriental species such as saffron, ginger, pepper and cinnamon. Frequently some parts of animals were prescribed in the preparation of medicines, for example, bees, birds (chicken, pheasant, gander, duck...), blood-sucking worm, wild boar, bull, among others. Another aspect which must be mentioned was that the reports were full of suggestions for nourishing diets, which included animal and vegetable products.

Also, some minerals were prescribed to the patients and used as medicines in a diversified range of processes: water, rocks, salts, iron, mercurial, nitro of Alexander and *lapizlazzulli* (lazurite).

Amatus Lusitanus referred to other organic materials and substances easy prepared at the time, such as sugar (coming from Madeira Islands), wine, Arabic gum, opium, vinegar, olive oil and oxymel (vinegar with honey).

In Table 1 we present the numbers of different plants, animals and minerals cited by the physician in the first set of medical episodes (100 cases). There are a small number of designations of materials which scientific identification and origin we did not yet do.

**Table 1**  
**Numbers of plant, animal and mineral materials cited in the first *Centuria***

<i>Plants</i>	<i>Animals</i>	<i>Minerals</i>
88	25	10

### **Techniques and Operations**

Some techniques and operations could be identified in the work of Amatus Lusitanus evidencing the involvement and the progressive development of the Iatrochemistry art and knowledge.

Preparation of syrups, pills, plasters, unguents, potions, used in liniments, as cataplasms, clysters, smoking were frequently prescribed. Techniques like maceration, extraction, dissolution, decoction, infusion, refrigeration, fermentation and others, are frequently suggested for the preparation of medicines.

### **Precision and Rigour in the Prescriptions**

Being the Renaissance the time of the development of the European trade, the need to measure was compulsive. A rigorous physician like Amatus Lusitanus, when he prescribed the medicines he indicated the amount of each species to be used, with a high precision. The use of rigorous amounts, expressing the unit of measure, was a constant in all the medical episodes reported in the *Centuriae* (Paixão, Jorge and Florido, 2005). Mainly he used or suggested amounts to be measured by a balance. Frequently he also suggested volumes, mainly for liquids. For the mass he frequently points to units of measure like the pound and half-pound, the ounce and half-ounce, drachma and half-drachma and the scruple. For the volumes he used, among others, the ounce for liquids.

Only a few times he use amounts not well defined, using anthropometric units as was the case of maniples and handfuls, despite these two units have been used frequently by apothecaries. There were, also, mention to units of length (mile, fathom, ell – three spans long, foot, span...) and of time (including the definition of hour as the 24<sup>th</sup> part of a day).

At this time we were far from any standardisation of the units of measure but his concern about the rigour is explicit in the frequent definition of the unit to be used. The case of the definition of the “day”, in the first *Centuria*, before the report

of the medical episodes, is an important example. After a detailed explanation he clarifies that the day is the equinoctial gap of 24 hours.

### “The spirit of the times”

The physician Amatus Lusitanus adopted a way of working, mainly based on observations and hypothesis or diagnostics of the sickness; the sound reflection during and after the situations or prescriptions conducted him to the analysis of the results describing carefully each clinical case. When he reflected on the cases he never hesitates to compare and, if it was his opinion, to make criticisms of earlier physicians, such as Dioscorides and Galenius.

In his work he said directly, that he did not accept the Aristotle’s theory of the four elements. In which respect to the field of Chemistry, *Paracelsus* was the most famous alchemist living in the same time of Amatus Lusitanus. There were no references to this alchemist in the text of the first *Centuria*. But it appears evident that he disagreed with *Paracelsus’* vitalist theory of the three principles of salt, sulphur and mercury. His public position was clearly against the idea to consider the human body as a place where the three principles changed one to another, giving disease or health. He considered himself as more rational, based on reflection, observing and experimenting (for more details see, among other references in the ambit of the history of chemistry, Salzberg, 1991, Multhauf, 1993 and Debus 2001, as well as the written work of Amatus Lusitanus). However, he used the substance mercury in some cases, mainly in those related with syphilis, as was the practice in Europe at that time.

### Conclusion

After having highlighted some aspects of the troubled life of the important renaissance Portuguese Physician João Rodrigues de Castelo Branco, identified as Amatus Lusitanus, examples were given of materials and substances, techniques, operations and units of measure referred in the text of the first *Medicinalium Centuria* of Amatus Lusitanus, some conclusions can be given:

- (i) The most used ingredients were organic; botanical species coming from the Mediterranean flora but also a vast range of animal origin materials were used, also minerals and some botanical species coming from the Orient and

Brazil. His contribution as a botanical observer and recorder is considered to be very important.

- (ii) There are descriptions to numerous operations in order to prepare the medicines, extractions, dissolutions, fermentation or refrigeration, well known even today in Chemistry Laboratories.
- (iii) There are references related to the precision and rigour in the prescriptions, particularly in respect to measurements of the quantities used in the preparation of medicines. Units of mass, volume, length and time were always indicated.

The growing of the use of balances in the instructions and prescriptions of Amatus Lusitanus in which respects to the preparation of medicines was an indicator of his great concern with rigour.

Amatus Lusitanus can be considered as a symbol of an anticipated rigour which would be translated into Modern Chemistry, the principle of mass conservation (Lavoisier, 1864). It is to be noted that his work methodology, like in modern sciences, included the rigorous observation and description of medical cases.

These aspects are distinctive marks of an important contribution to the development and empowerment of Chemistry. Only two centuries latter it changed and triumphed as a rigorous scientific field by the systematic use of sophisticated balances by Lavoisier and his followers. In his time Amatus Lusitanus made an important contribution in the field of Medicine and Pharmacy giving Chemistry the opportunity to affirm its importance.

**Acknowledgements:** *FTC- Portuguese Foundation for the Science and Technology, Project Ciência Viva VI-1375.*

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