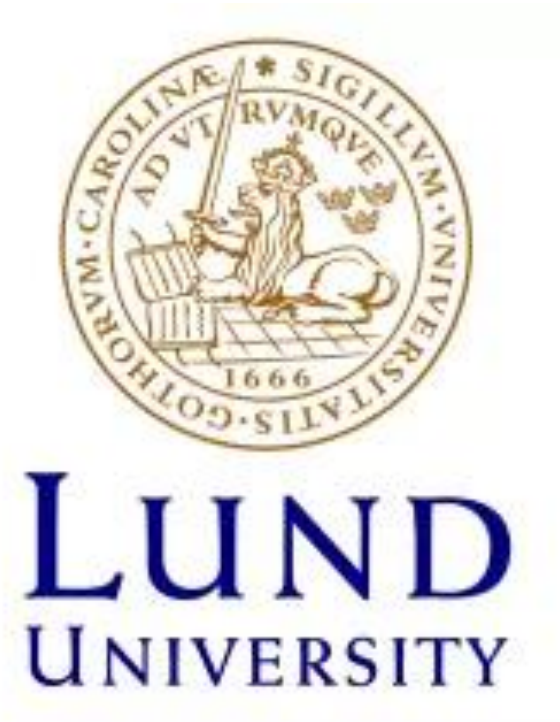
HEALING THE SICK: AN ARCHAEOBOTANICAL APPROACH TO MEDIEVAL NORDIC MONASTERIES AND MANUSCRIPTS



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Abstract

This thesis is a comparison analysis of two Nordic monastic sites -Naantali, located in Finland and Skriðuklaustur, located in Iceland- and three medieval herbals -*Läkebok* nr 4, *Läkebok* nr5 and AM 434a 12mo- from the same region. The objective is to examine the interlink between medicinal plants found in the different sources. To provide context to the analysis, the thesis first discussed medieval medicine and manuscript production, highlighting the central role occupied by monasteries during this period. Then, the study identified and compared plants with potential medicinal properties in the archaeological sites and herbals. Moreover, for the comparison analysis to be relevant, the results found for each source were confronted. The comparative analysis concluded on the high diversity of plants with potential therapeutic effects revealed in the slight crossover between sites and manuscripts. This study could be extended to a European scale to gather more data and investigate religious symbolism in medieval medicinal plants and herbal recipes.

Keywords: Monasteries, medicinal plants, Medieval Medicine; manuscripts, Nordic countries.

Table of contents

Table of Illustrations

I/ Introduction

1. Research background

Medicinal plants are at the core of the arts of healing during the medieval period. Nevertheless, it is a topic that does not seem to have interested many scholars in history or archaeology until the end of the 20th century, even though other subjects related to medieval health and medicinal practice have received scholarly attention. In particular, the main epidemics, such as the plague and leprosy, are well-studied subjects (Boldsen 2009; Brenner 2010; DeWitte 2014; Miller & Nesbitt 2023).

Regarding medicinal plants, especially in monastic complexes, research is limited. The reason lies in the difficulty of assessing the field. Indeed, similarly to the study of medicine in general for the period, one must navigate between religions, magic, charms, and artefacts utilised in medicine but not specific to it, such as scalpels (Horden 2009, p16; Bergqvist 2013, p79). Moreover, medieval monastic gardens are rarely conclusively identified as such during excavations. During the excavations carried out at Naantali monastery (1996-1997), the existence of a garden has only been assumed (Alanko and Uotila 2020, p 12). However, it is not an isolated case. Indeed, the excavation of Paisley Abbey's drain in Scotland by Camilla Dickson in 1990 provided numerous plant remains, including medicinal, but not the localisation of the garden (Dickson 1996, p25). Lastly, Saint Olof monastery in Sweden during the 1990s uncovered plant remains, including medicinal plants, from a kitchen floor. Nevertheless, there was no garden identified. The archaeologist Lindeblad in her study of medieval monastery gardens in Östergötland, Sweden, suspects that most of the plants at Saint Olof monastery were cultivated on-site (Lindeblad 2010, p301).

Due to its eclectic nature, some researchers go even so far as to disqualify medieval healing practices as medicine (Burridge 2022, p48). Indeed, many stereotypes about medieval medicine persist, considering it "stupid, irrational, or downright barbaric" (Green 2009, p1220; Horden 2009). As a result of the little interest and clichés, the field of medical archaeology progresses slowly, especially in the Nordic countries, with maybe the exception of Iceland.

The slow progression and lack of consensus on specific topics, such as the definition of medicine, led the field of medieval medical archaeology to progress without a clear theoretical framework. Researchers work sporadically on the topic, and one of the major works is Johanna Bergqvist's PhD thesis entitled *Läkare och läkande* (Bergqvist 2013). In her thesis, she investigated the professionalisation of medicine in Sweden during the Middle Ages and the Renaissance. More recently, Naomi Sykes and Julia Shaw published a book titled *The*

Archaeology of Medicine and Healthcare, which presents not a new theory but rather the application of deep-time approaches to the archaeology of medicine (see below) (Sykes and Shaw 2022).

Despite the slow progression and lack of consensus on particular issues, the field has been steadily increasing. Since the 1990s, archaeologists began to look into non-evident signs of medical practice. This more comprehensive approach corresponds to the rise of the post-processualist movement and the adoption of the deep-time approaches. As defined by Shaw and Sykes, deep-time approaches are nuanced approaches that try to fathom the complexity of medicine. They acknowledge the spread of medicine and care in the daily life of past civilisations and its intersection with religion and socio-cultural structures (Shaw and Sykes 2018, p370).

This thesis emerges in this context as it delves into one aspect of medicine, i.e. medicinal plants, through the lens of archaeobotany and historical data. This study is thus a complement to the broader field of medical archaeology since there is already much information about medical practices from an osteological and historical point of view. In this thesis, archaeobotany will add to the understanding of medieval medical practices from tangible sources, while the manuscripts will enable contrast, comparisons and contextualisation.

2. Research questions, objectives and expected results

- What information do we have regarding the practice of medicine in the monasteries under study?
- What types of plants were identified thanks to the archaeobotanical analysis of the sites?
- What types of plants were identified in the medical manuscripts?
- Which medicinal plants are found in both medieval monasteries and manuscripts? Which plants are not found in the two sources and why?
- How do archaeobotanical data and manuscripts contrast with one another?

This thesis aims to study medicinal plants at two medieval Nordic monastic sites, i.e. Naantali in Finland and Skriðuklaustur in Iceland, and their interlink with three medieval manuscripts, i.e. *Läkebok* nr 4, *Läkebok* nr 5 and AM 434a 12mo, from these two countries. This will be the foundation of my thesis -the material selection will be discussed in the material section (5.1).

There have been few archaeological studies done regarding this interlink in medieval Europe. Thus, my findings should conclusively bring new light onto medicinal plant knowledge

for Europe's periphery. Besides, I aim to challenge misconceptions about herbalism practices in the Middle Ages thanks to a multidisciplinary approach, increase our understanding of the role and use of medicinal plants in monastic settings.

Understanding medicinal plants is particularly interesting since their study give access to multiple layers of civilisation such as its relation to religion -although it is not the focus of this thesis- or the knowledge of medieval people in botany. Moreover, most plants had plural usage from a nutrition perspective to perfume and of course medicinal purposes (Van der Veen 2018, p53). The study of these plants falls under the archaeobotanical sub-discipline of archeology, which refers to the study of the interaction between humans and plants (Van der Veen 2018, p54). This interaction is assessed through plant remains found during excavations in relation to occupation contexts.

My thesis presents several objectives. First, I aim to identify and index medicinal plants uncovered in the monastic complexes and manuscripts. Once identified, I shall analyse the overlap between the sites, their assigned manuscript(s) as well as between the manuscripts. Finally, I shall compare the indexed plants from the sites and the manuscripts.

Of course, I should not disregard the historical contexts of the production and utilisation of medicinal plants. Overall, my thesis aspires to contribute to the field of medical archaeology and archaeology of monastic healing.[1] Also, I expect to find a rather strong correlation between medicinal plants identified in the monastic complexes and manuscripts.

3. Theoretical framework

In order to assess the role of medicinal plants in the healing practice of the medieval period, two concepts -medicine and healing- will be defined below and further explored in the first part of this thesis. These concepts are defined and applied by archaeologists, but also by historians and pharmacologists, among others.

The concept of medicine in this thesis refers to the history of the field of medicine and its evolution over time, such as the professionalisation of the field and the rise of medicine as a university discipline (Booth 2018). It also refers to how individuals in the Middle Ages viewed medicine. It encompasses several notions that are not prevalent nowadays, such as Galen's humour theory or its interlink with religion, superstitions, and the use of magic (Hajar 2012).

[1] It can be defined as a discipline that "focuses on the full spectrum of healing technologies, from managing the body in order to prevent illness, through to the treatment of the sick and preparation of the corpse for burial." (Gilchrist 2020, p71).

The latter also falls under the concept of healing. Thus, the concept of medicine is a broad term that involves a more theoretical knowledge of diseases and their causes. Hence, the overlaps with other concepts, like healing.

Although similar to the concept of medicine, the concept of healing focuses on the practitioners and their healing practices. Besides, it looks at how and where sick people were considered and treated within their community. It is thus "an intensely personal, subjective experience" (Egnew 2005, p255).

The case of herbalism is interesting since it can be considered both as part of the concept of medicine and the concept of healing. Indeed, from a medical perspective, herbal remedies are sought to cure a patient.[2] However, when related to the concept of healing, herbalism becomes a means for the patient to achieve well-being, spiritually and emotionally.

4. Material and methods

4.1. Materials

I was looking for monasteries and manuscripts to compare archaeobotanical and historical data. Therefore, I base my material selection on two factors: 1) my criteria and 2) the availability of the data. Concerning the criteria (1), they are as follows. First, the material must be a monastery and a manuscript from the medieval period (after 1000). The monastery should have been excavated and include an archaeobotanical study since I shall focus on medicinal plants. Regarding the manuscripts, it is predominantly the availability that led to my choice in addition to a translation in modern English for the Icelandic manuscript.

The monastery of Naantali (Finland), also called Nådendal in Swedish and Skriðuklaustur (Iceland) are the two selected monasteries. The first one, stems from the end of the Middle Ages and the beginning of the Renaissance, i.e. 15th and 16th centuries which echoes with Naantali, founded in the 15th century.

Each monastery got matched with a manuscript from its area and from the same period. Thus, Naantali monastery will be examined in parallel with *Läkebok* nr 4, written by the mother convent Vadstena for Naantali in the second part of the 15th century, and *Läkebok* nr 5 was written in the mid-15th century. Both have been transcribed by Gustaf Edvard Klemming in his book *Läke- och örte-böcker från Sveriges medeltid* (Klemming 1886). Skriðuklaustur will be studied alongside the catalogue AM 434a 12mo, a leechbook written around 1500 (Waggoner 2011).

[2] See, for example, manuscript AM 434a analysed in the fifth part of this thesis.

There is no translation into modern Swedish that I could find of *Läkebok* nr 4 and *Läkebok* nr 5. Thus, I shall analyse the manuscripts in old Swedish. In the case of the catalogue AM 434a 12mo, the translation is recent, which diminishes the chances of misunderstandings even though I shall bear in mind that the translation may have some inaccuracies. Thus, I shall be critical in my reading.

While this section delved into my material selection, the following will focus on the methods I shall use to analyse it.

4.2. Methods

I shall study two monasteries in total: one from -nowadays- Finland, Naantali, one from Iceland, Skriðuklaustur. The two sites are located on Europe's periphery. Each monastery represents a religious order: The Bridgettine order for Naantali Monastery and the Augustinian order for Skriðuklaustur.

I shall analyse the data in several steps. First, I shall gather and extract the data from the archaeological articles -or reports- and manuscripts. The archaeobotanical data I shall utilise does not focus specifically on medicinal plants. Instead, researchers divided the data into categories: pollen, food, medicine, or wild and cultivated plants. The classification depends on the objectives of the researchers. Thus, I shall go through the articles and select plants known to have medicinal properties in the Middle Ages -consequently they can be in several categories such as food and medicine. I shall pertain primarily cultivated ones since wild plants found on archaeological sites are more challenging to interpret as being used in the medieval period. Then, I shall generate a table for collected and relevant data for each site. Concerning the manuscripts, I shall focus on the medicinal plants mentioned and their properties. If wild plants are mentioned as having medical properties and used, I shall integrate the same species found on sites -if any- in my analysis. Still, I would be cautious as wild plants can grow on a site after it is abandoned, for instance. Once all the previous steps done, I will assemble the lists obtained through the archaeobotanical records and manuscripts. Thus, I shall proceed to a presence/absence analysis. That would allow me to move on to the comparative analysis.

A comparative study intends to analyse and compare data between several bodies, in my case, monasteries, to observe, understand and interpret the data based on similarities, differences or patterns. Following Charles Tilly's definition of the different types of comparative studies, I shall proceed to an encompassing comparison. He defines it as "different instances at various locations within the same system, on the way to explaining their characteristics as a function of their varying relationships to the system as a whole" (Tilly 1984,

p83). Thus, the pitfall would be to not analyse and compare the same variables, like the time period. However, all the monasteries compared in my thesis are from the end of medieval period.

Comparative studies in archaeology present both pros and cons. It is crucial to pinpoint its strengths and weaknesses to avoid pitfalls and, most importantly, use its full potential.

Context-heavy comparison of case studies allows seizing the specificities of each case and, of course, highlighting the contexts (Smith and Peregrine 2012, p11-12). Without grasping the historical context, it is challenging to draw satisfying conclusions in both archaeology and history. Another advantage of comparative studies is their capacity to capture cultural changes over time or geographical areas, thanks to patterns. Therefore, it allows us to understand the causes and effects of these patterns. When following Michael Smith and Peter Peregrine's article, it is clear that comparative analysis is a great tool to interpret archaeological records -whether it being chiefdoms or states- while acknowledging variations (Smith and Peregrine 2012). I shall give slightly more weight to archaeobotanical data than the manuscripts since the latter were not written by or for the monasteries studied. However, the archaeological excavations are site-specific.

Comparative analysis also presents cons. The major obstacle I will face is data standardisation, meaning that each case study may have a different system to interpret the data -per cent vs density. Consequently, it is vital to compare archaeological data, i.e. the archaeobotanical list (Latin names) established by previous researchers for each monastery rather than their interpretation of the data. To ensure a standardisation of my data, I shall create my own tables and list of plants to provide a synthesis of the sites and helping the reader. It may potentially lead me to make a statistical analysis. Comparative analysis can be biased since the data chosen may reflect the availability of the data or simply convenience. Likewise, I shall try not to generalise my interpretation of the data for all the Nordic countries -or Europe- since each case is different, despite patterns and regularities. The last limitation I shall mention is my own interpretation of the material, which can lead to misinterpretations. To counter my own potential biases, I count on my supervisor and classmates to give me feedback and generate a discussion.

The next part will focus on presenting medieval medicine first on a European scale to get an overview. Then, I shall concentrate more specifically on medieval medicine in the Nordic countries.

II/ Literature review of the history of medieval -herbal- medicine and manuscript production in monasteries

The history of medicine and medicinal plants has interested medieval and Renaissance scholars as well as researchers (physicians, historians, and archaeologists) from the 19th century onwards. The objectives and motivations behind their works are, however, different. Prior to the 19th century, the history of medicine helped legitimise and establish medicine as a respectable and scientific university discipline in Europe (Bergqvist 2013, p34). During and after the 19th century, the study of the history of medicine aimed primarily to understand the evolutions within the field. Thus, it was incorporated into the curriculum of medical students in some countries, including Sweden and Germany.

The study of medieval medicine and medicinal plants progresses slowly. Moreover, the paucity of agreement on certain issues, such as the definition of medicine, resulted in the field to evolve without a clear theoretical framework. It does not prevent it from getting attention from different fields, such as history, archaeology, and the medical industry. Several works may be highlighted as relevant contributors to the broader study of the field of medieval medicine, either from a historical or archaeological point of view. Alford explains the major shifts that occurred in the 1970s regarding the study of the history of medicine, i.e. historians started considering broader historical contexts to fully understand the development of medicine (Alford 1979). In medical archaeology, Bergqvist's thesis is a breakthrough in the study of medical tools in medieval Sweden (Bergqvist 2013). More recently, Rebecca Blackney proposed an interdisciplinary theoretical framework alongside methodologies for analysing archaeobotanical remains (Blakeney *et al.* 2023). The author encourages archaeologists to go beyond the more conventional frameworks and broaden their perspectives by incorporating medieval concepts such as the humour theory in their research. Supposedly, it will allow researchers to uncover new connections between cultural aspects and archaeobotanical data. In this regard, overall, most articles dealing with medical archaeology or history, as well as medicinal plants, mention and explain the central place of the humoral theory in medieval medical contexts (Alford 1979, p386; Horden 2009, p11; Stearns 2021, p65).

Based on my research (primarily in English, Swedish and French), archaeobotanical studies focusing on medicinal plants are sporadic around the world. This idea is strengthen thanks to Susan Francia's and Anne Stobart book, *Critical Approaches to the History of Western Herbal Medicine* (Francia and Stobart 2014). The two editors acknowledge that the study of the history of herbal medicine is fragmented (Francia and Stobart 2014, pXIV- XV). They also noticed that

the study of herbal medicine is not carried out in "any systematic and authoritative way" (Francia and Stobart 2014, p1). It is problematic since several fields of research study herbal medicine and medicinal plants, such as history, archaeology, pharmacology (Ho and Jie 2007; Murray 2008; Blakeney *et al.* 2023).

From the early days of archaeology a particular emphasis on medicine was made, predominantly through archaeosteology. The field has studied lengthily the plague and leprosy, for instance (Brothwell 1958; Reader 1974; Boldsen 2009; Crespo 2022).[3] However, research in medical archaeology remained few, and Bergqvist pointed out in her PhD thesis that the 1990s were not prolific for the field (Bergqvist 2013, p41). Monica Green also made a similar observation, stating that at the beginning of the 21st century, medicine was not as studied as it should be (Green 2009, p1218). Regarding the study of -medieval- herbal medicine, it developed, to a large extent, after the 1950s with the development of archaeobotany.

Although few, most studies have investigated how medieval individuals understood, cultivated, and used medicinal plants in their day-to-day practices as well as in cases of sickness (Murray 2008, p162; Kristjánsdóttir, Larsson and Åsen 2014; Watson and Gilchrist 2021, p2). It is a complex question since 21st century nomenclature is different, and our vision of what constitutes medicine and the role of plants have changed. Nevertheless, it is possible to address this issue thanks to interdisciplinary work combining historical and archaeological methods so as to get a broader and more accurate picture of the healing practices in the Middle Ages. Despite the value of interdisciplinary work, investigation of medicinal and therapeutic plants is conducted through narrower lenses. For example, in his chapter, *A Cook's Therapeutic Use of Garden Herbs* (Scully 2015), Terence Scully based his analysis of medicinal plants solely on medieval authors such as the physician Petrus Hispanus. He analysed medieval recipes over several centuries and countries in Europe. There was no collaboration with archaeologists nor any mention of archaeological finds.

Also, archaeobotanical studies that took place in monastic complexes and focused on medicinal herbs are even rarer. Nevertheless, an example would be the research conducted by Dickson at Paisley Abbey in Scotland (Dickson 1996). The primary goal of the excavation was not specifically to investigate herbalism. Indeed, the objective was to identify plant species to understand and reconstruct dietary practices and trade networks in which the abbey was involved. Nonetheless, some medicinal plants uncovered were *Chelidonium majus* or *Conjure maculatum*. The presence of these plants strongly indicates, for the author, that they were

[3] Historians have also investigated this matter as it is correlated to demography and economics (Green 2009, p1219).

cultivated in the monastic garden. More recent examples would be the palynological and archaeobotanical study conducted at the monastery of the (1) Carthusian order in Calci-Pisa in Italy and (2) the *Kortlagning klaustur á Íslandi p*roject (Gattiglia *et al.* 2023; Riddell *et al.* 2023). (1) The research conducted at Charterhouse of Calci-Pisa aimed to study the gardens belonging to the monastery. The theoretical framework,[4] and interdisciplinary approach allowed the reconstruction of the botanical landscape as well as the medicinal plants grown in the gardens (Gattiglia *et al.* 2023, p1). Plant remains with potential therapeutic properties found at the site include *Cannabis* (Hemp) or *Papaver* (Poppy) (Gattiglia *et al.* 2023, p8-10). (2) The Icelandic project *Kortlagning klaustur á Íslandi* aimed to map and study all monastic complexes on the island thanks to an interdisciplinary approach. Palynology played a significant role in reconstructing the past environment close to monastic sites as well as pollens of medicinal plants were identified, such as *Urtica dioica* (Common Nettle) and *Valeriana officinalis* (Valerian) (Riddell *et al.* 2023, p1-2).

The translation of manuscripts already existed during the Middle Ages and continues today. However, translations of medical texts, including herbals, to modern languages, such as English or Swedish, are harder to find. Many medical texts have been transcribed and digitalised, but no translations are available. Nonetheless, a research group based at the University of Würzburg in Germany aims to translate historical texts from monasteries between the 8th and 12th centuries to establish lists of plants with potential therapeutic effects and "active ingredients" (Watt and Hayes 2013, p3). They collaborate with a pharmaceutical company – GlaxoSmithKline- and the medicinal potency of the plants is tested in laboratories such as Würzburg University Hospital. Furthermore, a recent translation of the *Old English Herbarium* has been issued by Anne Van Arsdall (Van Arsdall 2023). The new translation brings in an updated context on herbals and herbal medicine from the medieval period. The previous translation stems back from the 19th century,[5] and carried many misconceptions as well as an "archaizing translation"[6] (Van Arsdall 2023, chapter 2).

Overall, this chapter demonstrated that the history of medicine and herbal medicine has interested scholars since the Renaissance, but the objectives kept changing over the centuries. The field progresses slowly due to a lack of consensus and theoretical framework within

[4] The researchers view gardens as "co-creation made together by human and non-human agencies" (Gattiglia *et al.* 2023, p1). Thus, they refute the idea that gardens are solely anthropocentric (Gattiglia *et al.* 2023, p17).

[5] Oswald Cockayne made the first translation of the *Old English Herbarium* (Van Arsdall 2023, chapter 1).

[6] Cockayne's use of the term Anglo-Saxo when referencing to the English High Middle Ages is nowadays deemed problematic (Van Arsdall 2023, chapter 2).

archaeology but also between the disciplines investigating the matter. Archaeobotanical studies, with a focus on medicinal plants in monastic complexes, although sporadic, are crucial to understanding how individuals understood, cultivated, and used medicinal plants. Additionally, the study of medieval herbals is essential, and they are constantly digitised. Nevertheless, even though some herbals, such as the *Old English Herbarium*, have updated translations, most often herbals' translations are often either old or non-existent.

The different aspects highlighted in this literature review add context to this thesis by providing an overview of the study of the history of medicine and medicinal plants as well as its interdisciplinarity. In this light, I shall, in the following chapters, critically analyse and compare medicinal plants identified through archaeobotany in two medieval monasteries and three herbals.

III/ Medieval medicine

To fully understand my analysis (chapter V), the reader must get an overview of what constitutes medieval medicine firstly on a European scale and secondly with a focus on the Nordic countries. This section will be a thematic overview, delving deeper into the specificities of medieval medicine since changes occurred over time but not significantly enough for a chronological overview to be relevant.

1.1. Presentation of medieval medicine on a European scale

The definition of medicine has evolved alongside its practice. Unlike today, it was mostly a household matter even though a broad spectrum of practitioners existed with blurred boundaries between them. Moreover, medicine was not based on heavy university training (Booth 2018). Indeed, the Middle Ages were infused with knowledge from the classical period, especially the theory of the four humours by Hippocrates (5th c. BC) and further developed by Galen in the 3rd century AD (Nutton 2024). Humourism bases itself on the balance of four Humours: yellow bile, black bile, phlegm, and blood (Jouanna 2012, p335; Huggon 2018, p836). They were influenced by the seasons but also -what we would call today- the way of life. The latter included dietary choices, physical activity, and medicine (Huggon 2018, p840; Stearns 2021, p66).

After a period of so-called "stagnation",[7] most medical theories developed and spread across Europe along with the rise of universities and broader adoption of Christianity (Mądra-Gackowska *et al.*, 2018, p1668). Thus, the famous University of Salerno published *Regimen sanitatis Salerni* around 900 AD, focusing on wellness through food choices and exercises (Huggon 2018, p837). Slightly earlier, Strabo wrote the first (preserved) record of medicinal plants and their effect on humans called *Hortulus*. In Poland specifically, Avicenna (980-1036) remained a reference regarding herbalism until the 1700s (Mądra-Gackowska *et al.*, 2018, p1671). Nevertheless, most medical texts were written from the 13th century onwards, corresponding to the more extensive development and acceptance of medicine as a university discipline falling under the practical philosophy field (Alford 1979, p382).

Laymen and ecclesiastics participated in writing and translating medical texts. Religion was never far away from the medical practice in the Middle Ages. Despite medieval medicine

[7] It is not a term I agree with. By having this terminology, Katarzyna Mądra-Gackowska implies that knowledge that does not exist in a written form and that reaches us is non-existent. However, it is known that pagans relied heavily on oral traditions and tacit knowledge. Moreover, I do not believe that civilisations are static.

being inspired by Greek, Roman, Egyptian and Islamic medicine, Christianity changed the perceptions of the sick (Mądra-Gackowska *et al.*, 2018, p1671). Indeed, a sick person was ill for mainly two reasons. First, it was due to an imbalance of their humours. Second, they had sinned (Brenner 2016, p461). According to Martin Huggon, people feared death greatly but feared even more having a sinful death (Huggon 2018, p837). However, in the vision and mission of a good Christian, charity is central. This spiritual and cultural shift led to the apparition of medieval hospitals in Europe.

1.2. Healing and healers in the medieval period

Hospitals first appeared in the 4th century but functioned primarily as shelters and as the -Greek or Latin- etymology of the word suggests, for the poor and needy (Brodman 2005, p3).[8] All hospitals provided short-term care, and only some treated long-term diseases such as leprosy, acting on both social and religious duties. In the 9th and 10th centuries, some monasteries started to serve as hospitals called monastic hostelries. In the 11th century across Europe, the number of hospitals increased alongside the urbanisation process. As a result, in France, Cluny had to set up a quota system in the 12th century (Brodman 2005, p4). That said, religious and non-religious individuals could find a hospital. Medieval hospitals did not have the same function as today, i.e. medical care of patients. Instead, they were multifunctional, providing food and shelter for orphans, and elderly people and took care of pregnant women and sick people (Davis 2010, p72). Contemporaries of the medieval period had a different vision of diseases than us. A "disease was the absence of health" (Stearns 2021, p 65). It was also linked to the balance or imbalance of someone's humours as well as ailments of the heart, liver, or brain. Moreover, diseases like leprosy were often associated with sinning. Religion and monasteries had a central role in the care of the sick, the elderly and pregnant women. Indeed, medicine was not necessarily part of the hospital complexes before the 14th century,[9] which coincided with the professionalisation of the field of medicine (Brodman 2005, p5).

The professionalisation of medicine emanated from a several-century-long process of the development of guilds, licensing, and scientific advancements (Park 1992; Carlhed 2013). This process was complex and not linear. Nonetheless, most women and religious practitioners

[8] The word hospital can thus be regarded as problematic or potentially misleading for the public if used in a museum, for instance, due to the differences with a contemporary hospital.

[9] He specifies that practitioners could be present in hospital complexes before the 14th, but it was far from being systematic. The oldest presence of practitioners within a hospital complex stems back from the 12th century in St John's great hospital in Jerusalem (Brodman 2005, p14). Moreover, instead of finding healers in hospitals, practitioners were mostly located in wealthy areas (Huggon 2018, p840).

were excluded from performing medicine by the end of the medieval period. The professionalisation of the field began to homogenise the art of healing. In the Holy Roman Empire, it started in the 12th century when the Emperor Frederick II established licensing (Siraisi 2009, p17-18). Sometimes, the Church could issue licenses like in 13th century Bologna. The appearance of licenses and guilds was a means to -try to- regulate and co-opt aspiring practitioners, corresponding with the state formation process that occurred in Europe, which entails a greater control of laws and justice. Despite the licensing, many practitioners operated without one, taking the risk of prosecution.[10] The regulation also aimed to establish the profession as legitimate through universities where attendees tended to theorise the field (Alford 1979; Wallis 2010; DeMaitre 2013).

Practitioners of the art of healing were highly heterogeneous. Here are a few. *Physici* - physicians- also called *Medicus,* were the only (male) practitioners to have university training, except in Italy, where barber surgeons were allowed at University (Bullough 1959, p447; Bergqvist 2013, p84; Heimdahl and Vretemark 2018, p318). In most parts of Europe, skilled practitioners were called barber surgeons and master surgeons - the latter more accomplished and of higher prestige. Both were relatively infrequent and in 1435 England, only 17 master surgeons were registered (Booth 2018, p5). The difference between master surgeons, and barber surgeons is blurry since many aspects of their practice overlap (Booth 2018, p4). At the bottom of the hierarchy of practitioners were barbers. Barbers could not do any invasive surgery, unlike barber surgeons. Most practitioners would learn their craft during an apprenticeship lasting several years. It is widely accepted that practitioners were viewed as having inherited the craft providing them healing hands. Yet, medicine was, especially in the earlier Middle Ages, a social ladder as becoming an ecclesiastic was (Siraisi 2009, p25). Thus, Vern L. Bullough, in a cynical lecture of history, considers that practitioners were performing the art of healing out of the pure lure of profit and that they played on the fears of their patients (Bullough 1959, p446). However, many healers needed a complementary income like farming (Booth 2018, p4) and most charity institutions like hospitals developed during the period.

I would like to finish this section by briefly mentioning female practitioners. The status of women healers seems difficult to assess as they are rarely mentioned in historical sources. It is undeniable that women were performing medicine. However, based on some evidence, Monica Green portrays an equality in the practice between men and women (Green 1989). If

[10] Records of the 16th century revealed that people were being prosecuted for practising without a license. Thus, it shows that it is a process that took time to be all set. However, it was during the 16th century that a more apparent division between practitioners appeared (Booth 2018, p1).

accurate how can on explain their almost absence from the records?[11] Moreover, women were not allowed to attend university, except in Salerno (Ferraris and Ferraris 1997, p1856). For A. Casey, the rise of universities came along with a diminishing attitude towards women practitioners switching their reputation from respectable practitioners to witches (Casey 2016, p1). Women did not seem to be stuck to the role of midwives and according to Nancy G. Siraisi some are known for performing surgery (Siraisi 2009, p27). Research is still needed in this area, but it appears that both genders were heavy users of medicinal plants.

1.3. Medicinal plants and medical tools

Practitioners of the medieval period use massively medicinal herbs and minerals or animal body parts among other things were also commonly used (Murray 2008, p162; Francia and Stobart 2014, pXIV). Medicinal plants were the bedrock of medieval medicine, and gardens were essential to control the availability of medicinal plants and to store them for the non-growing season (Mądra-Gackowska *et al. 2018,* p1673). A considerable amount of medical knowledge, notably herbal medicine, was gathered and spread by monasteries across Europe. Moreover, monastic recipes and manuscripts were often based on empirical observations (Casey 2016, p1). Monastic gardens were not exclusively used to grow medicinal plants (*herbularius*) but also food (*hortulus* and *pomarius*)[12]. They were meditation areas linked to the holy (Grésillon 2007, p78), and many plants represented religious symbols, like *Lilium candidum* (Madonna Lily) representing Mary (Beck 2000, p387). Monastic gardens were often built in *hortus conclusus* shape, i.e. small square -or rectangular- gardens surrounded by fences and are often represented in artworks of the 15th and 16th centuries and refer to Mary's Garden[13]. For the reasons I mentioned above, monastic gardens are the perfect way to study the role and use of medicinal plants as well as the relationship between medicinal plants and religion.

Although archaeobotany, written sources and sometimes illustrations can help identifying medicinal plants, medical tools are more difficult to identify. Indeed, tools do not appear to be specific to the field of medicine as spoons, whisks could be used in a household, for instance (Bergqvist 2013, p55). The context in which they are found is then primordial to identify medical practices. Ointment jars and venipuncture irons are probably the only specialised tools

[11] Only 24 female practitioners are known in Naples between the 13th and 15th centuries (Siraisi 2009, p27).
[12] The line between plants cultivated for food and medicinal purposes is not always clear in medieval contexts and recipes.
[13] They developed, especially after the 12th century, when Marian devotions spread across Europe.

that archaeologists can identify with certainty. Lastly, most vessels were made out of wood, skin, and thus are rarely found in archaeological contexts.

In this section, I have made an overview of medicine in medieval Europe delving into several aspects such as its origins, its evolution over times drawing from examples across Europe. I also addressed some challenges archaeologists face with potential medical artefacts. In the next section, I would like to concentrate on medieval medicine in the Nordic countries.

2. Medicine in the Nordic countries

The previous section was an overview of medieval medicine, but this section aims to concentrate more specifically on Europe's periphery since Sweden,[14] and Iceland will be the main focus of my study. I shall not go through an thematic overview but rather pinpoint how similar or dissimilar the medical practice in these countries in comparison with the rest of Europe were.

Even though situated in Europe's periphery, Nordic practitioners knew about the humoral theory since the early Middle Ages (Klemming 1886). However, it was not widely spread. Also, they had some anatomy knowledge. They knew, for instance, that the lungs and heart are vital to live compared to other organs and that it is almost impossible to cure if damaged (Collins 2018, p3). Moreover, they understood that some diseases had external effects that could be observed. Not to dissimilar to the rest of Europe, they did not fully understand how the spread of diseases worked, but they had an idea on how to limit its spread (isolation being one) (Bergqvist 2013, p143).

Interestingly, the term doctor already existed in the Nordic countries for the period under study. In old Norse, it meant the one who can heal (Bergqvist 2013, p187). Sweden -but the Nordics in general- had a diversity of practitioners. Nevertheless, fewer practitioners would have a university education compared to the rest of Europe. The main reason was that they had few universities (Bergqvist 2013, p193). I would like to underline that what constitutes a fully-fledged practitioner in the Middle Ages is not the degree but their experience and reputation. Besides, there are assumptions about the lack of practitioners in Sweden for the Middle Ages. But these assumptions are based on writings from the reign of Gustav Vasa, complaining about the lack of practitioners. In 14th century Sweden, guilds appeared in Stockholm, signifying professionalisation.

[14] Naantali is nowadays in Finland but in the Medieval period it was part of Sweden. Hence, why I focus rather on medieval medicine in Sweden than Finland.

Other signs of the professionalisation of the field of medicine in Sweden appear in laws. The Upplandslagen -Uppland Law- dating from the 13th century, reveals the introduction of legal doctors. A legal doctor is described as a practitioner who has healed wounds and broken bones but also chest and stomach wounds (or cuts) (Schmid 1951, p310; Bergqvist 2013, p248).[15] Furthermore, in the 14th century, King Magnus Eriksson made legislation that stipulated that the king's doctors were exempted from certain taxes, but more importantly we learn that offenders have to pay a doctor to the wounded. Nonetheless, it is difficult to know how effective these legislations were.

The professionalisation process of medicine reveals two main categories: exogenous conditions and endogenous conditions. The former refers to conditions at a state level (even when the state is in formation itself), like the strategy regarding public health care and control of the people practising medicine. The latter refers to individuals' actions, such as the organisation of guilds. Overall, the two are interlinked, and the development of the state particularly favoured professionalisation (Carlhed 2013, p3), except in Iceland. Indeed, in Iceland, healing and health were not controlled nor organised by a central authority (Tirosh, Crocker 2021, p122). Owing to its remoteness, Norwegian -and then Danish kings from the 13th century onwards- had difficulties thrusting laws, especially since they had their own parliament, the Alþingi and assemblies, i.e. the Things (pers.com. Viðar Pálsson 2021).

Across Sweden and Scandinavia there were different types of hospitals and leprosaria, run by monasteries and towns. Sometimes the distinction between the different institutions is not clear. Leprosaria and *helgeandshus* are a perfect example.[16] The confusion is due to the poor explanations regarding the two institutions in the historical sources and they were both found in urban areas, which adds to the incertitude. *Helgeandshus* appeared -or can clearly be identified as such- first in Denmark in the 13th century and in the 14th century for Sweden (Arleskär 2007, p3). However, they are not specific to the Nordic region and already existed in the rest of Europe. The regulation and organisation of hospitals in Sweden are found in *Ordning för Stockholms Helgeandshus och Hospital*, issued by Gustav Vasa in 1533 (Arleskär 2007, p3). However, as Martin Arleskär points out it is more than probable that the regulations were based on older ones. In Sweden, the term hospital appeared in the High Middle Ages and designated primarily leprosy hospital (*spetälskesjukhus*). Leprosy was the most common disease in the first half of the Middle Ages hence why hospitals welcomed mostly lepers.

[15] En laga läkare "har läkt sår av huggvapen, sår med benbrott, sår i bröst eller magen [....]" (Bergqvist 2010, p351).
[16] House of the Holy Spirit in English.

In the medieval era, understanding the properties of medicinal plants was paramount to the practice of medicine. During the 13th century in Sweden, numerous collections of botanical and medicinal knowledge were compiled. The most significant of these was Codex M5, a comprehensive source of information on medicinal and botanical subjects (Larsson 2013, p9). Moreover, continental herbalism influenced Swedish herbalism since the 9th century, thanks to the circulation of Latin manuscripts in monastic contexts. Not only manuscripts but plants were also imported. That is the case in Iceland, for instance. Thus, *Plantago major* (Great Plantain), a plant widely used across European monasteries, has been proven archaeologically to have been imported (Smith 2014, p205).

IV/Medieval medical manuscripts and the role of the Church in knowledge production

1. Monasteries as medical centres and centres of knowledge

1.1. The role of monasteries in medieval healing practices

The medieval period was characterised by the rise of charity reflected by the number of orders that had facilities within monasteries to look after the sick (Davis 2014, p935; Brenner 2020, p865). The Benedictine, the Augustinian and the Cistercian Order were particularly prominent (Brenner 2020, p 865-867). The architecture and organisation of monasteries underline this call for charitable work. An often-cited example would be the plan of St Gall. This plan from the 9th century reveals areas dedicated to the care of the sick.

One can observe that the patients are separated from the rest of the community. Indeed, they have their own chapel and cloister. This idealistic plan is most likely not the most widespread form of a monastery. The reason is that some were smaller than others, and the plan of St Gall monastery is the only complete plan known to this day, and it was supposed to serve as a model for Benedictine monasteries (Sanderson 1985, p616).

In some Cistercian monasteries, infirmaries were predominantly located in the southern-eastern part of the monastery, which was the contact zone between the *intra* and *extra claustrum* like in the Alvastra monastery (Regner 2005, p194; Bergqvist 2013, p208). Furthermore, it was only from the 9th century onwards that monasteries began to include hospitals in their facility, then called monastic hostelries (Brodman 2005, p3).

Through their infirmaries and hospitals, nuns, and monks -and lay practitioners- would tackle physical and mental well-being (Bergqvist 2013, p146; Brenner 2020, p866).[17] In England, historians estimated that there was approximately "one monastery for every 2-3,000 people" for the medieval period (Furniss 1968, p244). To this number can be added hospitals often run by clerics (Brenner 2020, p668). The two had a slightly different purpose. Indeed, monasteries focused primarily on "spiritual care", while hospitals focused primarily on providing shelter (Furniss 1968, p244). Nonetheless, the line between the two can be hard to draw,[18] particularly since their charity aspect of this medical care is rooted in biblical principles

[17] No distinction was made during the medieval period (Bergqvist 2013, p146).

[18] Researchers disagree on that matter as some consider that monasteries and hospitals were closer than one might think in their practice of the arts of healing and that they complemented each other (Gilchrist 2020, p72). Roberta Gilchrist wonders if archaeology can prove which type of care was provided in a monastery and a hospital, which would end the debate.

(Matt. 25:31– 46). Attending the sick and those in need was regarded as helping Jesus himself (Davis 2014, p936). Besides, if followed, this principle would increase people's chance to be saved and go to heaven during the Last Judgment (Brenner 2020, p866).

Based on Canon laws, it appears that after the Lateran Council of 1215, members of the clergy became highly discouraged -not to say banned- from practising medicine or surgery. Already, during the Council of Clermont in the 11th century, the Church stipulated that the regular clergy should not practice medicine (Amundsen 1978, p22). Nevertheless, the reiteration in the different councils indicates that it was challenging to implement these regulations. Moreover, most clerics were part of the secular clergy, i.e. they did not follow a rule. Thus, it implies that it was harder to enforce the regulations on them.[19] In Alvastra Abbey (12th to 16th c.) for instance, surgical tools have been found such as probes and forceps together with "glass and ceramic medicine vessels" (Brenner 2020, p867; Watson and Gilchrist 2021, p13). Not only surgery was often performed in monastery, but the preparation and administration of herbal treatments was central in religious care of patients. Excavations at Saint Mary spital revealed a building for distillery alongside distillery vessels presenting traces of lead, arsenic, and mercury -which was common in medieval remedies (Watson and Gilchrist 2021, p21). Also, historical and archaeological sources reveal the implication of ecclesiastics in herbal medicine like Hildegard of Bingen (1098-1179). She received a formal medical education -including herbal medicine- by her order, which was a relatively common practice (Casey 2016, p1518). Her medical principles and cures continue to inspire people (Micke O. *et al.* 2011, p150). Besides, Strabo, abbot of Reichenau, in his *Hortulus* lists twenty-three medicinal plants and their properties but also mentions how to look after the plants (Strabo 2008, p6). Moreover, the blueprints of monastic complexes often indicate the presence of gardens as one can see on the plan of Saint Gall.

2. Medieval medical manuscripts in the Nordic countries.

Throughout the Middle Ages, clerics contributed to medical knowledge by copying and translating ancient medical texts, as well as Hebrew medical texts and herbal manuals, allowing the spread of knowledge (Gilchrist 2020, p73). Medical knowledge continued to be transmitted primarily through practice, though some remained tacit. In the Nordic countries, *Läkebok* nr 1 to nr 7, for instance, were medical manuscripts written by ecclesiastics from the 15th to 16th

[19] The Church aimed to encourage its clergy to focus more on their devotion to God. Thus, hospitals founded in the later part of the Middle Ages were run by "merchants, guilds", or even "urban communities." (Gilchrist 2020, p72).

centuries and aimed at different monasteries across Sweden. These differences will be briefly touched upon.

The Nordic countries also contributed to the compilation, translation and spread of medical knowledge during the Middle Ages, although medicine developed late into a University discipline (Bullough 1966, p81; Bergqvist 2013, p187).

Probably the most well-known Nordic medieval medical author is Henrik Harpestreng. His *Liber Herbarum* and *De simplicibus medicinis laxativis,* though written in Latin in the 13th century, were later translated into several languages such as Danish, Swedish, Norwegian, and Icelandic (*Henricus Harpestreng - medieval* 2012). Moreover, he is the author of the oldest - known to us and surviving- herbal written in a vernacular language in Scandinavia, i.e. *Liber Herbarum* also called *Den danske urtebog* in Danish. Iceland presents few medieval medical texts, but AM434a is one of them (Waggoner 2011). It was written around 1500 and is the only one translated into English.

Unlike Iceland, Sweden has numerous compilations of medicinal and botanical knowledge made during the 13th century. The largest one is Codex M5,[20] which gathers information on medicinal plants, among other themes, based on the Danish book *Laegebog* by Christiern Pedersen from 1533 (Larsson 2013, p 12). Swedish monasteries held the majority of medical manuscripts in the Middle Ages (Nordin 2022, p 465), unlike some countries like Scotland. Moreover, they were "centers for medical knowledge" (Heimdahl and Vretemark 2018, p317). A great source to study Swedish medical manuscripts is the *Läke- och örte-böcker från Sveriges medeltid utgifna* by Klemming (Klemming 1886). He compiled medical recipes and lists of medicinal plants from different medieval manuscripts. I shall delve deeper into the specificities of two of the *läkeböker* in the next part of my thesis as part of my analysis and comparison of the archaeobotanical data from three monasteries.

[20] It is also known as *Läkebok* nr 7 in *Läke och örteböcker från Sveriges medeltid* by Klemming (Klemming 1886; Larsson 2013).

V/ The analysis

A/ The monasteries

1. Naantali

1.1. Background

Located in nowadays southwest Finland, Naantali was then part of Sweden. Due to its proximity with Turku -an important town in the Middle Ages- and relation with Vadstena monastery, Naantali's Bridgettine monastery became a pilgrimage destination for the elite (Alanko and Uotila 2020, p3; Kuiper 2024). After receiving the permission of King Kristoffer, the mother convent supervised the construction of the convent founded in 1443. At first, all monks and nuns came from Vadstena, and it is not impossible to imagine that they brought with them medicinal plants. Moreover, the monastery was wealthy, especially in land, due to recurrent donations by elites and pilgrims (Alanko and Uotila 2020, p4). Yet, after the Reformation, King Gustav Vasa took its lands, resulting in the bankruptcy of the monastery in the following decade. Indeed, the monastery did not close down. Nuns and monks were allowed to stay and perceived a subsidy, although the "convent church converted to Lutheran" (Alanko and Uotila 2020, p4). Thus, 1554 signalled the end of the catholic monastic life in the following decades. Indeed, the last nun of Naantali died in 1591 (Alanko 2017, p13).

A town was established in proximity to the Bridgettine monastery. According to Teija Alanko and Kari Uotila, a hospital was founded, but most likely not within the monastic complex (Alanko and Uotila 2020, p4). However, the presence of a hospital within the convent is certain since during the plague in 1495, and then in 1508, the monastery's hospital received the sick (Alanko and Uotila 2020, p4). Regardless of the location of the hospital, one can assume that it would motivate the cultivation of medicinal plants since a manuscript containing medicinal plants is known to belong to Naantali, i.e. the herbal of Naantali (*Läkebok* nr 4). Furthermore, archaeological excavations conducted at the site revealed medicinal plant remains.

1.2. The data

1.2.1. Excavations at Naantali

I shall draw upon the excavations done at Naantali monastery in 1996-1997 for the data analysis. That marks the first conventional archaeobotanical study conducted at the site (Alanko and

Uotila 2020, p3). However, only the church was excavated, and the garden's location remains unknown (Alanko and Uotila 2020, p4). Four areas were investigated around the church and obtained 32 samples. The samples consist of soils from small squares of different layers. The samples range from 0.2 litres to 7.5 litres (Alanko and Uotila 2020, p5). The flotation technique was deemed the more appropriate to isolate and wash the plant remains. The samples were either put in Saturated NaCI or tap water. Prior to the flotation, "clayey samples were […] dissolved in KOH-solution" (Alanko and Uotila 2020, p5).[21] Besides, different meshes, going from 0.125 mm to 0.250 mm, were used. Then, the remains were counted and identified thanks to a stereomicroscope and several reference collections. Plant remains were finally divided into five categories. The researcher acknowledges that the division is arbitrary since "many species can belong to many groups" (Alanko 2017, p18). Thus, I shall verify that the other categories do not include medicinal plants.

As mentioned above, 32 samples were collected from the monastery church, resulting in 4,561 plant remains. However, wild strawberries are preponderant, with 2416 seeds. Besides, many seeds remain unidentified. Among those identified, not all were medicinal plants (see 1.2.2). Lastly, the dating of several layers from the excavated areas revealed two dates ranging from "cal AD 1255–1390 to cal AD 1520–1805 (95.4% confidence)" (Alanko 2017, p23). Thus, the dating of the samples overshoots the time range of this thesis. Consequently, I shall exclude the data relating to periods beyond the Middle Ages from the analysis.

1.2.2. Analysis

The study of Naantali is part of a larger project that encompasses five sites of different kinds, and Naantali is the only monastery. In total 94 taxa were found at Naantali. The plants present at the site were part of various categories generated by the researcher, such as garden plants, useful plants, and collected wild plants or cultural weeds and field weeds (Alanko 2017, p23). These categories focus primarily on the ecological characteristics of the plants. Her objective is to shed light onto past environments. I overlooked these categories because some plants can be in one or several categories, which may reflect the usage of the plants for different purposes (food and medicinal, for instance). Furthermore, she did not have a category for medicinal plants because it did not enter her study framework. Therefore, based on the tables made by

[21] A KOH solution contains potassium hydroxide (KOH). In Archaeobotany, KOH is used as a pre-treatment to separate the clay from the remains before a wet-sieving or flotation process since clay does not disperse properly in water (Vandtorpe and Jacomet 2013, p207).

Alanko (Alanko 2017, p20-22), I isolated the plants present only in Naantali and reorganised them by alphabetical order to enhance comprehensibility (Table 1).

Latin Names	**English Names**
Agrostis sp.	Bentgrass
Alchemilla sp.	Lady's Mantle
Alisma plantago-aquatica	Water-plantain
Anthriscus sylvestris	Wild Chervil
Arctium tomentosum	Woolly Burdock
Arctostaphylos uva-ursi	Bearberry
Arenaria serpyllifolia	Thyme-leaved Sandwort
Atriplex patula	Spear Saltbush
Avena sativa/Avena sp.	Oats
Betula nana	Dwarf Birch
Betula pendula	Silver Birch
Betula pubescens	Downy Birch
Brassicaceae	Mustard family
Bromus secalinus	Rye Brome
Bromus sp.	Brome Grass
Cannabis sativa	Hemp
Carex nigra	Common Sedge
Carex ovalis	Oval Sedge
Carex sp. Distigmatae	Sedge Distigmatae
Carex sp. Tristigmatae	Sedge Tristigmatae
Centaurea cyanus	Cornflower
Chelidonium majus	Greater Celandine
Chenopidium sp.	Goosefoot
Chenopodium album	Fat-hen
Cerealia	Cereals
Cirsium arvense	Creeping Thistle
Corylys avellana	Hazel
Eleocharis palustris	Common Spike-rush
Empetrum nigrum	Crowberry

Fallopia convolvulus	Black Bindweed
Festuca rubra	Red Fescue
Fragaria vesca	Wild Strawberry
Fumaria officinalis	Common Fumitory
Galeopsis speciosa	Large-flowered Hemp-nettle
Galeopsis sp.	Hemp-nettle
Galium boreale	Northern Bedstraw
Galium sp.	Bedstraw
Hordeum vulgare	Barley
Humulus lupulus	Hop
Hyoscyamus niger	Henbane
Hypericum maculatum	Imperforate St. John's-wort
Juncus sp.	Rush
Juniperus communis	Common Juniper
Lamium purpureum	Red Dead-nettle
Lapsana communis	Nipplewort
Lithospermum arvense	Field Gromwell
Lithospermum sp.	Gromwell
Luzula sp.	Woodrush
Malus sp.	Apple
Persicaria hydropiper	Water-pepper
Persicaria lapathifolia	Pale Smartweed
Persicaria maculosa	Lady's Thumb
Picea abies needle	Spruce
Picea abies/Pinus sylvestris	Spruce/Pine
Pisum sp	Pea
Plantago major	Greater Plantain
Poa sp.	Meadow Grass
Poa sp./Agrostis sp.	Meadow Grass/Bentgrass
Poaceae	Grass family
Polygonum aviculare	Knotgrass
Polygonum sp.	Knotweed
Potentilla anserina	Silverweed

Prunella vulgaris	Self-heal
Prunus sp.	Cherry
Ranunculus acris	Meadow Buttercup
Ranunculus flammula	Lesser Spearwort
Ranunculus repens	Creeping Buttercup
Rhinanthus sp.	Yellow-Rattle
Rubus idaeus	Raspberry
Rubus saxatilis	Stone Bramble
Rumex acetosa	Common Sorrel
Rumex acetosella	Sheep's Sorrel
Rumex sp.	Dock
Sambucus racemose	Red Elderberry
Secale cereale	Rye
Scleranthus sp. Receptacle	Knawel
Spergula arvensis	Corn Spurry
Sorbus aucuparia	Rowan
Stellaria graminea	Lesser Stitchwort
Stellaria media	Common Chickweed
Stellaria sp.	Stitchwort
Taraxacum officinale	Dandelion
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Trifolium sp.	Clover
Urtica dioica	Common Nettle
Vaccinium myrtillus	Bilberry
Vaccinium oxycoccos	Cranberry
Vaccinium sp.	Blueberry
Vaccinium uliginosum	Bog Bilberry
Vaccinium vitis-idaea	Lingonberry
Viola sp.	Violet
Vicia sp.	Vetch

TABLE 1 LIST OF ALL MACROFOSSILS FOUND AT NAANTALI.

Once done, I decided to exclude all remains that were not known to be medicinal plants during the Middle Ages. In order to assess it, I read articles focusing on medicinal plants for the period under study and the National Library of Medicine.[22]

I was able to identify fifty-six plants with medicinal properties (Table 2) based on both medieval and post medieval medical knowledge. For instance, *Vaccinium vitis-idaea* (Lingonberry) or *Rubus idaeus* (Raspberry) are nowadays well-known antioxidants and anti-inflammatory plants (La Torre *et al.* 2024, p1). Nonetheless, the presence of these plants on the site does not necessarily indicate that they were used for medicinal purposes.

Latin names	English names	Seed count
Alchemilla sp.	Lady's Mantle	3
Arctostaphylos uva-ursi	Bearberry	6
Betula pubescens	Downy Birch	45
Cannabis sativa	Hemp	4
Carex nigra	Common Sedge	2
Carex ovalis	Oval Sedge	1
Centaurea cyanus	Cornflower	4
Chelidonium majus	Greater Celandine	136
Chenopidium sp.	Goosefoot	1
Chenopodium album	Fat-hen	132
Cirsium arvense	Creeping Thistle	6
Corylys avellana	Hazel	1
Eleocharis palustris	Common Spike-rush	1
Empetrum nigrum	Crowberry	1
Fragaria vesca	Wild Strawberry	2416
Fumaria officinalis	Common Fumitory	1
Galeopsis speciosa	Large-flowered hemp-nettle	2
Galium boreale	Northern Bedstraw	3
Galium sp.	Bedstraw	19
Hordeum vulgare	Barley	10
Humulus lupulus	Hop	2
Hyoscyamus niger	Henbane	68

[22] It is an official website of the US government (*National Center for Biotechnology Information*, no date).

Hypericum maculatum	Imperforate St. John's-wort	1
Juniperus communis	Common Juniper	216
Lamium purpureum	Red Dead-nettle	1
Lapsana communis	Nipplewort	2
Persicaria hydropiper	Water-pepper	4
Persicaria lapathifolia	Pale Smartweed	5
Persicaria maculosa	Lady's Thumb	1
Pisum sp	Pea	1
Plantago major	Greater Plantain	1
Polygonum aviculare	Knotgrass	81
Polygonum sp.	Knotweed	3
Potentilla anserina	Silverweed	2
Prunella vulgaris	Self-heal	1
Prunus sp.	Cherry	1
Ranunculus acris	Meadow Buttercup	1
Ranunculus flammula	Lesser Spearwort	1
Ranunculus repens	Creeping Buttercup	2
Rubus idaeus	Raspberry	48
Rubus saxatilis	Stone Bramble	1
Rumex acetosa	Common Sorrel	11
Rumex acetosella	Sheep's Sorrel	6
Rumex sp.	Dock	5
Spergula arvensis	Corn Spurry	31
Stellaria media	Common Chickweed	48
Taraxacum officinale	Dandelion	1
Trifolium pratense	Red Clover	2
Trifolium repens	White Clover	15
Urtica dioica	Common Nettle	2
Vaccinium myrtillus	Bilberry	6
Vaccinium oxycoccos	Cranberry	14
Vaccinium sp.	Blueberry	15
Vaccinium uliginosum	Bog Bilberry	7
Vaccinium vitis-idaea	Lingonberry	8

TABLE 2 PLANTS WITH POTENTIAL MEDICINAL PURPOSES ALONG WITH THEIR COUNT AT NAANTALI

The majority of plants are represented by a single or small number of seeds but only fourteen of them exceed the count of 11 seeds. As a result, the data is comparable with Skriðuklaustur, which presents a more limited amount of remains, i.e. fourteen. Yet, it is enough to draw satisfactory conclusions. Indeed, it allows for a more in-depth analysis of the remains while not being too restrictive. The selection of the fourteen most present plants was acquired thanks to a pivot table generated in Excel (Table 3).

Latin Names	English Name	Seed count
Betula pubescens	Downy Birch	45
Chelidonium majus	Greater Celandine	136
Chenopodium album	Fat-hen	132
Fragaria vesca	Wild Strawberry	2416
Galium sp.	Bedstraw	19
Hyoscyamus niger	Henbane	68
Juniperus communis	Common Juniper	216
Polygonum aviculare	Knotgrass	81
Rubus idaeus	Raspberry	48
Rumex acetosa	Common Sorrel	11
Stellaria media	Common Chickweed	31
Spergula arvensis	Corn Spurry	48
Trifolium repens	White Clover	15
Vaccinium oxycoccos	Cranberry	14
Grand Total		**3225**

TABLE 3 THE FOURTEEN MOST PRESENT MEDICINAL PLANTS AT NAANTALI ORGANISED IN ALPHABETICAL ORDER.

The most predominant medicinal plant is *Fragaria vesca* comprising 2416 seeds, followed far behind by *Juniperius communis* with 216 seeds. In Alanko's classification, these remains belong to several categories. Indeed, *Fragaria vesca* belongs to useful plants and collected wild plants; *Juniperus communis* belongs to trees and shrubs; *Chelidonium majus* belongs to garden plants, useful plants, collected wild plants, and the like.

I interpret that the high amount of *Fragaria vesca* indicates that it is not -only- a plant used for its medicinal purposes but rather for its taste. I would propose a similar explanation

for *Juniperus communis, Polygonum aviculare*, *Rubus idaeus* and *Vaccinium oxycoccos* as they are edible. On the other hand, *Chelidonium majus* can be poisonous, and so is *Hyoscyamus niger* (Chiej 1984, p80).

Latin Names	English Name	Seed count
Fragaria vesca	Wild Strawberry	2416
Chelidonium majus	Greater Celandine	136
Juniperus communis	Common Juniper	216
Chenopodium album	Fat-hen	132
Polygonum aviculare	Knotgrass	81
Hyoscyamus niger	Henbane	68
Rubus idaeus	Raspberry	48
Spergula arvensis	Corn Spurry	48
Betula pubescens	Downy Birch	45
Stellaria media	Common Chickweed	31
Trifolium repens	White Clover	15
Galium sp.	Bedstraw	19
Vaccinium oxycoccos	Cranberry	14
Rumex acetosa	Common Sorrel	11
Grand Total		**3225**

TABLE 4 LIST OF THE FOURTEEN MOST PRESENT PLANTS AT NAANTALI ORGANISED FROM HIGHEST TO LOWEST COUNT

I will now briefly explain the potential use of each plant listed in the table (Table 4). *Fragaria vesca* (Wild Strawberry) is traditionally used for "gastrointestinal, cardiovascular and urinary disorders" (Liberal *et al.* 2014, p113). *Juniperus communis* (Common Juniper) can be made into an aromatic oil with claimed antiseptic properties as well as being a diuretic (Raina *et al.*, 2019). *Chelidonium majus* (Greater Celandine) could have potentially been used for its pain-relieving properties and as a treatment for jaundice or gallstones (Zielińska *et al.* 2018, p1). *Chenopodium album* (Fat Hen) claims to have laxative properties and purify the blood (Poonia and Upadhayay 2015, 3977). *Hyoscyamus niger* (Henbane) is one of the most well-known medicinal plants from the medieval period -and before. It is associated with the cure of insomnia, pain-relieving (including dental pain) and even as an *anaesthetic* (Passos and Mironidou-Tzouveleki 2016, p768). *Polygonum aviculare* (Knotweed) may have been used to

treat skin-related problems or kidney problems (Benrahou *et al.* 2023, p409). Apart from its flavour *Rubus idaeus* (Raspberry) was commonly utilised to "treat wounds, diarrhoea, colic pain and as a uterine relaxant" (Rojas-Vera, Patel and Dacke 2002, p665). *Spergula arvensis* (Spurry) may have been utilised to treat wounds and as a diuretic, but it may have been primarily consumed as a vegetable (Sundarapandian, Thekkekkara and Nanjan 2016, p150). The bark of *Betula pubescens* (Downy Birch) is laxative, astringent and diuretic (Chiej 1984, p54). *Stellaria media* (Chickweed) may help cases of asthma and diarrhoea. But also, jaundice and measles, among other properties (Oladeji and Oyebamiji 2020, p1). *Galium sp.* has different properties depending on the species. However, in her study, Alanko has only been able to identify the seed at a genus level (Alanko 2017, p20-22). Therefore, it is difficult to determine for what conditions the plant was used, although *Galium sp.* is generally used both internally and externally to treat a wide range of conditions. It ranges from treating nose bleeding, gout to diarrhoea and stress (Turcov *et al.* 2022, p2). Apart from its antioxidant properties *Vaccinium oxycoccos* (Cranberry) has been used in traditional medicine in Finland and Sweden to treat urinary infections (Jurikova *et al.* 2018, p1-2). *Trifolium repens* (White Clover) is believed to be antiseptic and analgesic. It may also help in case of rheumatism and inflammation (Ahmad and Zeb 2020, p14). *Rumex acetosa* (Common Sorrel) is used to reduce inflammation especially in the sinuses. It is also said to be useful in case of constipation or jaundice (Bello *et al.* 2019, p149). Although these plants belong to different categories, they all possess medicinal properties. These properties may have been known by its users. Moreover, one can notice that they all claim to treat a wide range of diseases and conditions. However, it is no easy task to assess whether they worked and how they were combined solely based on archaeobotany. Hence, a comparison with Naantali's herbal book (i.e. *Läkebok* nr 4) and *Läkebok* nr 5 should bring up answers (see V/B/1.).

In this first section, Naantali's archaeobotanical data has been analysed to assess the types of plants identified by archaeobotany with a greater focus on medicinal plants and their properties. In the next section, Skriðuklaustur shall be presented and the archaeobotanical data studied in the same fashion.

2. Skriðuklaustur

2.1. Background

Located in eastern Iceland, Skriðuklaustur is the last monastery -out of nine- to be founded in Iceland prior to the Reformation (Kristjánsdóttir 2010, p45; Smith 2014, p204). Indeed, it was

founded in 1493 and remained in use until 1552. Its Church got consecrated in 1512 which is rather late comparing to the foundation of the rest of the monastery.

Even though Skriðuklaustur's existence was brief, it accumulated large amounts of land partly because of its location on an old farm called Skriða (Kristjánsdóttir 2008, p208; Smith 2014, p204). This donation by Cecilía Þorsteinsdóttir to the Church was to repent for marrying her second cousin and fight for her children's rights. Nevertheless, East Iceland lacked a monastery, and in the second half of the 15th century, the region faced a volcanic eruption in the Vatnajökull glacier (Kristjánsdóttir 2008, p214) and plagues. Hence, it encouraged Bishop Stefán Jónsson to build a monastery.

Belonging to the Augustinian order,[23] the monks living at the site attended to the sick, pregnant women and the elderly (Smith 2014, 204). Medicinal plants and an infirmary hall have been archaeologically found (Kristjánsdóttir 2010, p48), as I shall explain in the next section.

2. 2. The data

2.2.1. Excavations at Skriðuklaustur

The site under study is the third monastic site to be excavated. The research took place from 2002 to 2010 under the supervision of Steinunn Kristjánsdóttir after surveys in 2000 (Kristjánsdóttir 2008, p52; Smith 2014, p204). These surveys revealed that the site was 1200 m^2 and well preserved. Moreover, the architecture of the site is similar to other monastic complexes in Europe -unlike other Icelandic monasteries- in that, it had a "church, abbot's lodging, dormitory, chapter house, refectory, kitchen, infirmary hall, storage room and stables" and two-story high (Kristjánsdóttir 2010, p48). Nonetheless, it was built with local materials, i.e. driftwood, turf, and stones. The monastery had a cloister-garden of 100 m^2 and, interestingly, it also served as a cemetery (Kristjánsdóttir 2010, p49).

The excavation did not aim to investigate plants specifically. However, the plants uncovered in the cloister-garden revealed that some of them were imported, highlighting the connectedness of Iceland with the rest of Europe. Although articles about the excavation provide details about the found plants and pollen analysis, I could not find information regarding the number of samples that were taken nor the exact procedure conducting the analysis. Ten medicinal plants have been identified, including three not native to Iceland but very common in monastic complexes across Europe (Kristjánsdóttir 2010, p51). It is these ten plants that will form the basis for the analysis of my thesis.

[23] The Augustinian order has the particularity to be in relatively close contact with the outside world since their ideal is to serve society by being charitable (*Who We Are | The Order of Saint Augustine*, no date).

2.2.2. The analysis

The archaeobotanical studies done at Skriðuklaustur lack clarity. Indeed, the data was disseminated through several articles and reports that do not necessarily present the data in the same manner nor the same plants, although samples were taken at the site from 2003 to 2010 (Shaw 2012, p4). Consequently, the analysis presented here relies on the scattered information. Also, almost all the botanical remains excavated have potential medicinal properties. Thus, it indicates that monks actively cultivated -medicinal- plants (Larsson *et al.* 2012, p11).

Latin Names	**English Names**
Allium	Onion/Garlic
Betula pubescens	Birch
Galuim verum	Ladies' Bedstraw
Juniperus communis	Common Juniper
Plantago major	Common Plantain
Ranunculus acris	Buttercup
Rhinanthus minor	Little Yellow Rattle, Rattlebox
Sassafras albidium	Sassafras
Thalictrium alpinum	Alpine Meadow-rue
Urtica dioica	Nettle

TABLE 5 MEDICINAL PLANTS FROM SKRIÐUKLAUSTUR EXTRACTED FROM SMITH (SMITH 2014)

This table (Table 5) by Deborah Smith shows "the ten herbs used with medieval nursing and medical care" found at the site during the 2002 to 2010 excavations (Kristjánsdóttir 2008, p208; Smith 2014, p244).

Unfortunately, there is a lack of clarity regarding the number of samples taken. Moreover, there is no seed count available. In her report, Patricia Shaw proceeded to a presence-absence analysis (Shaw 2012, p4). A reason may be the quantity of pollen found. Indeed, it is easier to sort pollens with a presence-absence than a count. Lastly, pollen and seed analysis are compiled in the same table. Thus, I shall consider both pollen and seed samples in addition to the botanical remains listed in other articles describing the site. Indeed, after further readings, additional remains classified as medicinal plants appeared.

Latin Names	Types
Allium sp.	Pollen
Borago officinalis	Seed
Brassica sp.	Seed
Betula pubescens	Unspecified
Galuim verum	Pollen
Juniperus communis	Pollen
Linum catharticum	Seed
Plantago major	Pollen
Ranunculus acris	Unspecified
Rhinanthus minor	Unspecified
Sassafras albidium	Unspecified
Thalictrium alpinum	Unspecified
Urtica dioica	Seed
Urtica urens L.	Unspecified

TABLE 6 LIST OF PLANT REMAINS WITH POTENTIAL MEDICINAL PROPERTIES ALONG THEIR TYPE FOUND AT SKRIÐUKLAUSTUR.

Some remains were not in Shaw's table (Shaw 2012, p12). Therefore, it was not possible to generate a presence-absence table. Instead, this table (Table 6) aims to provide the reader with a comprehensive list of the all the remains with potential medicinal properties found at the site along their type. Various articles related to Skriðuklaustur cited most plants listed in the table. However, among these fourteen plants, the six following ones appeared in only one article (Smith 2014, p206): *Betula pubescens, Ranunculus acris, Rhinanthus minor, Sassafras albidium, Thalictrium alpinum and Urtica urens L*.

Latin Name	English Name
Allium sp.	Allium (onion/garlic)
Borago officinalis	Starflower/Borage
Brassica sp.	Brassica
Betula pubescens	Downy Birch
Galium verum	Lady's Bedstraw
Juniperus communis	Common Juniper

Linum catharticum villilín	Purging Flax
Plantago major	Great Plantain
Ranunculus acris	Meadow Buttercup
Rhinanthus minor	Yellow Rattle
Sassafras albidium	Sassafras
Thalictrium alpinum	Alpine Meadow-Rue
Urtica dioica	Common Nettle
Urtica urens L.	Dwarf Nettle

TABLE 7 LIST OF PLANT REMAINS WITH POTENTIAL MEDICINAL PROPERTIES FROM SKRIÐUKLAUSTUR WITH THEIR NAME BOTH IN LATIN AND ENGLISH.

I will now briefly explain the potential use of plants listed in the table. *Allium sp.* (Onion/garlic) contains about 600 species, many of which have medicinal properties such as reducing cholesterol, lowering blood pressure or anti-inflammatory (Kumar, Bhowmik and Tiwari 2010, p287; Charron and Novotny 2016, p184). *Borago officinalis* (Starflower) claims to treat coughing, fever, and micturition (*BORAGE: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews*, no date). *Brassica sp.* is a genus containing several species that assert medicinal properties, and it is difficult to determine for what conditions the plant served. Some of their characteristics are inflammation, tension, and anti-bacterial (Kapusta-Duch *et al.* 2012, p389; Agrawal, Yallatikar and Gurjar 2019, p40). *Betula pubescens* (Downy Birch) is thought to be diuretic, astringent and even laxative, and may help in case of Eczema (Chiej 1984, p54). *Galium verum* (Ladies' Bedstraw) is believed to have "anti-inflammatory, analgesic, antioxidant" properties (Bradic *et al.* 2023, p2). Regarding the properties of *Juniperus communis* (Common Juniper), see 1.1.2 and Rajinder Raina's article (Raina *et al.* 2019). *Linum catharticum villilín* (Fairy Flax) could be used in case of rheumatism or liver problems (Lust 1979, p160). *Plantago major* (Common Plantain) is, perhaps, the most commonly known medicinal herb in medieval Europe. This plant was used to heal wounds and used as an anti-inflammatory. Moreover, in Swedish -but also Icelandic- the vernacular name refers directly to the medicinal use of the plant (Kristjánsdóttir, Larsson and Åsen 2014, p 572).[24] *Ranunculus acris* (Meadow Buttercup) may relieve asthma, hay fever and rheumatism (Foster and Duke 2000, p123). *Rhinanthus minor* (Yellow Rattle) seems to have been used in herbalism to treat eye related problems or in the form of tea (Zhang *et al.* 2021, p2). *Sassafras*

[24] In Swedish, *Plantago major* is called *gro* and *græða* in Icelandic. Both names mean "the process of healing of a wound" (Kristjánsdóttir, Larsson and Åsen 2014, p572).

albidium (Sassafras) can help treating eye inflammations (Hausner and Poppenga 2013, p348). *Thalictrium alpinum* (Alpine Meadow-Rue) is believed to relieve stomach-aches, rheumatism as well as being tonic (Singh, Singh and Lekhak 2023, p1). *Urtica dioica* (Common Nettle) is alleged to help with arthritis, tension and could have anti-inflammatory characteristics (*Urtica Dioica - an overview*, no date). Lastly, *Urtica urens L.* (Dwarf Nettle) is said to be a good astringent, tonic as well as diuretic (Lust 1979, p308)

Analogously to the study of Naantali's macrofossils, the plants found at Skriðuklaustur monastery carry multiple medicinal characteristics to cure various ailments and afflictions. The lack of knowledge of the chemical compounds that form medicinal herbs during the Middle Ages may explain the plethora of properties attributed to the plants. Their understanding of plants' characteristics was rooted in empirical observations (Casey 2016, p1).

The data analysed in this section shall be put in perspective with the study of the AM 434a 12mo manuscript (see V/B/2). Ultimately, the data reported and analysed for each monastery shall be further critically assessed in section V/C to properly compare the two sites.

B/ The manuscripts

1. *Läkebok* nr 4 and *Läkebok* nr 5

1.1.1. Background and description of the manuscripts

The two manuscripts that are the subject of this analysis date from the 15th century and little is known about them. However, *Läkebok* nr 4 is from Codex Holm A 49, i.e. Naantali's monastery book written by Vadstena monastery. This herbal is rather short – ten pages in the transcribed version (Klemming 1886). *Läkebok* nr 5 is part of Codex Ups. C19 and is longer than *Läkebok* nr 4 since it is constituted of seventeen pages. Klemming transcribed them both in his compilation of medical books from medieval Sweden (Klemming 1886). This book has been the basis for my research on plant names within *Läkebok* nr 4 and nr 5.

The two manuscripts differ in their presentation of the plants. *Läkebok* nr 4 consists of list of plants with some indications on how to use them and each paragraph starts with a plant forming the basis of the recipe. Nevertheless, the proportions are not always indicated nor for how long a treatment should be used. This could indicate that the users of the manuscripts were relatively versed in making herbal treatments and could adjust the basic recipe depending on a particular situation. The recipes in *Läkebok* nr 4 are not solely plant based but advise using

honagh (honey) or *castoreum* in combination with certain plants.[25] Also, this herbal may have had educational purposes since the author specifies -for some plants- the Latin name in addition to the vernacular name. Sometimes, there is also a description of the plants.[26] Moreover, there are references to ancient authors like "*Plinus"* and "*Ysaac"*, [27] which underlines connections to Roman knowledge and the rest of Europe. Similarly, in *Läkebok* nr 5 the author mentions Hyppocrates ("*ypocrates"* in the text, p172). Besides, the manuscript presents the recipes in a similar fashion than *Läkebok* nr 4. However, paragraphs don't necessarily start with the name of a plant but rather the type of pain the following recipe is intended for. See for instance, "*For howdzwärk skal man tagha abrot oc malyrt*". [28] Furthermore, in the second part of the manuscript, instead of describing the different pains, the author gives "medical" names for various conditions based on where their location in the body such as *parapleumonia* or *coriza*. There is also a mention of the humoral theory in both manuscripts mentioning the quality of a plant -hot and dry, for instance.

The quality of the plants is not going to be our focus in the next section as I aim to generate a table with a list of the medicinal plants to then be able to compare the data with both the Icelandic manuscript and the archaeobotanical data from Naantali.

1.1.2. Lists of the medicinal plants

After reading and translating the two manuscripts, I generated the following tables (Table 8; Table 9). I tried to be as exhaustive as possible, but some plants may be missing as equivalence in Latin, modern Swedish or English is unavailable.

The table is divided into three sections: old Swedish, Latin names, and English. The tables are organised alphabetically based on the old Swedish to highlight the plant names as found in the texts. The Latin names ensure a standardisation of the data, mainly because the old Swedish names have several spellings throughout the manuscripts. Moreover, the reader may not be familiar with these names. Consequently, a translation in English is provided when possible. Some Latin or English versions of the plant names are not certain. As a result, they are marked by (?) in the two tables.

[25] Beavers' gland secretion (Burdock 2007, p51).
[26] An example could be the case of *Juniperus communis.* The paragraph starts with "JVniperus thz är eneträ oppa swänsko […]. Thetta trä bär trigiahande fruct, the första är grön bär oc sma [...] (Klemming 1886, p154).
[27] As written in the *Läkebok* nr 4 (Klemming 1886, p161).
[28] For a headache one should take southern wormwood and wormwood (personal translation; Klemming 1886, p164).

Old Swedish	Latin names	English names
Aloe	*Aloe sp.*	Aloe
Anis	*Pimpinella anisum*	Anise
Camomilla	*Asteraceae*	Chamomile
Celidonia	*Chelidonium majus*	Great Celandine
Eneträ	*Juniperus communis*	Common Juniper
Fikor/fikommen	*Ficus sp. (?)*	Fig
Kanel	*Cinnamomum sp.*	Cinnamon
Malyrt	*Artemisia absinthium*	Wormwood
Mirra	*Commiphora myrrha*	Myrrh
Mirtus	*Myrtus communis*	Myrtle
Näsla	*Urtica spp.*	Nettle
Origanus	*Origanum sp.*	Oregano
Pipperot	*Armoracia rusticana*	Horseradish
Rökilse	(?)	Incense
Rosär	*Rosa sp.*	Rose
Sjnap/sinap	*Brassicaceae*	Mustard
Staphisagria	*Staphisagria macrosperma*	Staphisagria
Viole	*Viola sp.*	Violet

TABLE 8 LIST OF MEDICINAL PLANTS IDENTIFIED IN LÄKEBOK 4 ORGANISED IN ALPHABETICAL ORDER BASED ON THE OLD SWEDISH NAMES.

Sixteen plants were identified in *Läkebok* nr 4. Seven were identifiable at a genus level (symbolised by *sp./spp.* in the table) and eight at the species level. Two were identified only at a family level: *Asteraceae* and *Brassicaceae.* In the case of the latter, for instance, the use of the vernacular name prevents a more advanced identification since mustard could be *Sinapis alba* or *Brassica nigra* depending on whether it is white or black mustard seeds. Moreover, both seeds claim to have medicinal benefits (Holtom and Hylton 1979, p452; Lust 1979, p). Incense is the only case where it has been impossible to find a Latin equivalent to the old Swedish name as numerous plants can be used to make it and the manuscript does not give any specification.

Old Swedish	Latin names	English names
Absintium malirth	*Artemisia absinthium*	Wormwood
Abroth/ Arbrotanum	*Artemisia abrotanum*	Southernwood

Anetum dill	*Anethum graveolens*	Dill
Apium	*Apium sp.*	Apium
Aristologia	*Aristolochia sp.*	Aristolochia
Arthimesia	*Artemisia sp.*	Artemisia
Buglossa	*Anchusa officinalis (?)*	Bugloss
Celidonia	*Chelidonium majus*	Great Celandine
Cicuta	*Cicuta sp.*	Cicuta
Cerifolium	*Anthriscus cerefolium*	Chervil
Dictamnus	*Dictamnus sp.*	Dictamnus
Enula	*Inula sp.*	Inula
Eufrasia	*Euphrasia sp.*	Euphrasia
Feniculum	*Foeniculum sp. (?)*	Fennel
Hwslök	*Allium sativum*	Garlic
Ingefer	*Zingiber officinale*	Ginger
Juniperus	*Juniperus communis*	Common Juniper
Komiin	*Carum carvi*	Caraway
Liin	*Linum usitatissimum*	Flax
Lolium	*Lolium sp.*	Lolium
Löök	*Allium cepa*	Onion
Lybherstikka	*Levisticum officinale*	Lovage
Mariubium	*Marrubium sp.*	Horehound
Myntha	*Mentha sp.*	Mint
Nigella	*Nigella sativa (?)*	Black Cumin
Origanum kunnungher	*Origanum vulgare*	Oregano
Papauer	*Papaver sp.*	Poppy
Pastinaca	*Pastinaca sativa*	Parsnip
Petrocilium päthersilia	*Petroselinum crispum*	Parsley
Pionia	*Paeonia sp.*	Peony
Piper	*Piper.sp*	Pepper
Pipperoot	*Armoracia rusticana*	Horseradish
Plantago	*Plantago major (?)*	Great Plantain
Pulegium	*Mentha pulegium*	Pennyroyal
Rosa	*Rosa sp.*	Rose

Ruta	*Ruta graveolens*	Common Rue
Salix	*Salix sp.*	Willow
Saluia	*Salvia sp.*	Sage
Saffran	*Crocus sativus*	Saffron
Saxifraga	*Saxifraga sp.*	Saxifrage
Sinapum sinnaper	*Brassicaceae (?)*	Mustard
Sponsa solis	*Calendula officinalis*	Pot Marigold
Vrtica	*Urtica spp.*	Nettle
Ysopus	*Hyssopus officinalis*	Hyssop

TABLE 9 LIST OF THE MEDICINAL PLANTS IN LÄKEBOK NR 5 ORGANISED IN ALPHABETICAL ORDER BASED ON THE OLD SWEDISH NAME.

Due to the length of *Läkebok* nr 5, the number of plants is more substantial than *Läkebok* nr 4. Indeed, a total of forty-two plants are listed in the table. Twenty-four were identifiable at the species level, twenty at the genus level. Only one was identified at a family level, i.e. *Brassicaceae*. However, it is not certain that *Sinapum sinnaper* refers to the *Brassicaceae* family. This table presents more uncertainty in the identification of the plants (Table 9). Five plants have been marked by (?). Nevertheless, in the case of *Plantago*, the uncertainty resides at the species level, i.e. *Plantago major.* This species is known for its medicinal properties and thus the mention of *Plantago* in the manuscript mostly likely refers to this species.

1.1.3. Interpretation

The two tables reveal the great diversity of medicinal plants available or at least known to medieval readers for these manuscripts. Moreover, all these plants claim medicinal properties, but they are either herbs or trees. Although the list from *Läkebok* nr 4 is much shorter than the one of *Läkebok* nr 5, they have numerous plants in common, which are as follows: *Juniperus communis* (Common Juniper), *Plantago major* (Great Plantain), *Origanum sp.* (Oregano), *Urtica spp.* (Nettle), *Chelidonium majus* (Great Celandine), *Armoracia rusticana* (Horseradish), *Artemisia absinthium* (Wormwood) and *Rosa sp.* (Rose).

Some of these plants were expected, such as Common Juniper. Indeed, this plant has been well-known for its medicinal properties, i.e. diuretic and antiseptic, since ancient times (Raina *et al.* 2019, p2). *Läkebok* nr 5 acknowledges its utilisation by Hypocrates and should be *"godha mot paralisim"*.[29] *Läkebok* nr 4 advises to make oil out of the berries or in a drink or food. Both

[29] Helps in case of paralysis (personal translation; see Klemming 1886, p173).

manuscripts claim overall that Common Juniper is good to maintain strength. On the other hand, *Hyssopus officinalis* (Hyssop) was expected to be present in two herbals since it is renowned for its medicinal use, particularly in the form of tea as well as its religious significance in rituals during the Middle Ages (Judžentienė 2016, p471; Barbezat 2022, 493).

After analysing the plants found in *Läkebok* nr 4 and 5, we shall in the next section assess the plants found in Icelandic manuscript AM 434a 12mo.

2. AM 434a 12mo

2.1.1. Background and description of the manuscript

Nowadays preserved in Copenhagen at the Arnamagnæan Institute, AM 434a 12mo was written in Iceland around 1500. The manuscript is incomplete as its first pages are missing, including the title -if any. This medical book is 49 pages long and has been written by two scribes. Its structure is interesting since it combines medical remedies -including medicinal plants- alongside charms and prayers for therapeutic and non-therapeutic use. Moreover, the manuscript is unstructured. Yet, similar conditions are grouped. For instance, on page eight of Waggoner's translation, the reader can read: "In case the eye becomes clouded", "For the same", "Also for the eyes", and "Also for the same" (Waggoner 2011, p8). Moreover, there is a section where medicinal plants are listed in alphabetical order, in Latin, along with their properties. Besides, AM 434a 12mo includes remedies that contain sheep's gall or mule's hair, for example.

Also, the manuscript either directly quotes ancient authors such as Dioscorides (*Diaskorides* in the text),[30] or Galen (*Galienus* in the text). It may be for educational purposes or to legitimise some recipes or comments. Furthermore, the use of Latin followed by the plant name in vernacular language is not specific to this manuscript and reinforces the educational aspect.

2.1.2. Lists of the medicinal plants

In addition to his translation of the Icelandic manuscript under study, Ben Waggoner generated a table listing all the plant names in AM 434a 12mo (Waggoner 2011, p32). The table below is greatly inspired by it. However, some modifications were made. The table is divided into three columns: Old-Icelandic names, Latin names, and English names. The labelling of Old-Icelandic names refers to the plant names as found in the manuscript. Sometimes, the Latin root is evident, but at some other times, they are of Norse origin.

[30] Author of the renowned *De Materia Medica.*

Also, Ben Waggoner suggests identifications at the species level for most plants, such as mint. The manuscript only describes mint as "*mintu*" or "*mynnta*" but, he ventures that it could refer to *Mentha sp.*, *Mentha spicata*, *Mentha longifolia* and similar species. Thus, for all analogous cases, the table generated for this thesis will be content with identification at the genus level (*Mentha sp.*, for example). Moreover, as for the other manuscripts, mustard is not identifiable at the genus nor species level and is thus indicated at a family level (*Brassicaceae*) in the table (Table 10). Besides, some plants are marked by (?) when the botanical identification is uncertain. Eight Latin plant names have been marked by it.

Old Norse-Icelandic Names	**Latin Names**	**English Names**
Accacia	*Acacia sp.*	Acacia
Aagrimonianum/agrimoniam/agrimony	*Agrimonia eupatoria*	Agrimony
Alimandus	*Prunus dulcis*	Almond
Ambrosia	*Achillea millefolium/Artemisia spp. (?)*	Ambrosia (?)
Dragontea/ dragunnica	*Arum maculatum/ dracunculus vulgaris (?)*	Wild Arum/ Dragon Arum
Balsamum	*Commiphora opobalsamum*	Balsam
Baunir	*Vicia fava*	Beans
Betonica	*Stachys officinalis*	Betony
Aristologia/ holurt	*Aristolochia sp.*	Birthwort
Pipinella	*Pimpinella saxifraga*	Burnet
Caules/kauli	*Brassica oleracea*	Cabbage
Calcedonia/ celidonia	*Chelidonium majus*	Celandine
Apium	*Apium graveolens*	Celery
Cenntaurea/ centauree	*Centaurea centaurium/ centaurium erythraea (?)*	Knapweed/ Common Centaury
Cinnamomum	*Cinnamomum verum*	Cinnamon
Gariophilum	*Syzygium aromaticum*	Cloves
Minna pulegium	*Thymus serpyllum*	Creeping Thyme
Constensio	*Nasturtium officinale*	Cress

Cupembe	*Piper cubeba*	Cubeb
Ciminum/ komin	*Cuminum cyminum*	Cumin
Anetum	*Anethum graveolens*	Dill
Diptamnium	*Origanum dictamnus/ Dictamnus albus (?)*	Dittany
Skogar-sura	*Rumex sp./ Lactuca seriola (?)*	Dock
Klungur	*Rosa canina*	Dog-rose
Enula/ holurt	*Inula helenium*	Elecampane
Alme	*Ulmus sp.*	Elm
Fenicule/ feniculum	*Foeniculum vulgare*	Fennel
Fikiur	*Ficus carica*	Figs
Solsequium	*Calendula officinalis/ Cichorium intybus/ Taraxacum sp. (?)*	Follow the sun (?)
Thus	*Boswellia carteri*	Frankincense
Gallica	*Alpinia officinarum*	Galangal
Kloflauk	*Allium sativum*	Garlic
Basilica/ skarsæta	*Gentiana sp.*	Gentian
Ingefer/ inifri	*Zingiber officinale*	Ginger
Selia	*Salix caprea*	Goat-willow
Vinber	*Vitis vinifera*	Grape
Senecciones	*Senecio vulgaris*	Groundsel
Eleborum/ elebori/ ellebore	*Veratrum album*	Hellebore
Marubbii/ marrubio	*Marrubium vulgare*	Horehound
Barbaiovis	*Sempervivum tectorum*	Houseleek
Ysopi/ ysopo	*Hyssopus officinalis*	Hyssop
Reykelsi	*Boswellia sp. / Commiphora sp. (?)*	Incense
Edera	*Hedera felix*	Ivy
Eine-berr, elne	*Juniperus communis*	Common Juniper
Lava-ber	*Laurus nobilis*	Laurel
Licorcia/ sæti-vidur	*Glycyrrhiza glabra*	Licorice

Lilio	*Lilium candidum*	Lily
Bilisticum/ libisticum	*Levisticum officinale*	Lovage
Rubea/ rauda-gras	*Rubia tinctorum*	Madder
Burkn/ burknni	*Dryopteris filix-mas*	Make fern
Malvas	*Malva sylvestris*	Mallow
Mastior	*Pistacia lentiscus*	Mastic
Mintu/ mynnta	*Mentha sp.*	Mint
Buna	*Artemisia vulgaris*	Mugwort
Sinapis/mustardr	*Brassicaceae*	Mustard
Mirra	*Commiphora sp.*	Myrrh
Nott-lauk	*Allium sp. / Platanthera bifolia (?)*	Night-leek (?)
Oleo-tre	*Olea europea*	Olive
Blot-lauk	*Allium cepa*	Onion
Migo	*Papaver somniferum*	Opium
Astimaca/ mura	*Pastinaca sativa*	Parsnip
Erptr	*Pisum sativum*	Peas
Glietnarum/ pulegium	*Mentha pulegium*	Pennyroyal
Fioma/ peonia	*Paeonia officinalis*	Peony
Piper/ pipar	*Piper sp.*	Pepper
Læknes gras	*Plantago sp.*	Plantain
Portalego	*Portulaca oleracea*	Purslane
Rafanum/ raphanum	*Raphanus sativus*	Radish
Reponticum	*Rheum sp.*	Rhubarb
Rosaa	*Rosa sp.*	Rose
Ruta / rutan	*Ruta graveolens*	Rue
Crocus/ saffran	*Crocus sativus*	Saffron
Salvia/ silura	*Salvia officinalis*	Sage
Acedula/ sura	*Rumex sp.*	Sorrel
Abrotani/ abrotanum	*Artemisia abrotanum*	Southernwood
Narda	*Nardostachys jatamansi*	Spikenard
Greni	*Picea abies*	Spruce
Saturea	*Satureja hortensis*	Summer Savory

Mirtus/ pors	*Myrica gale*	Sweet Gale
Þistil	*Cirsium arvense*	Thistle
Vervena	*Verbena officinalis*	Vervain
Vide/ vidar	*Salix sp.*	Willow
Vitrum	*Isatis tinctoria*	Woad
Malurt/ abscinnteo	*Artemisia absinthum*	Wormwood
Mellefolii/ mellifolium	*Achillea millefolium*	Yarrow

TABLE 10 POTENTIAL MEDICINAL PLANTS FROM AM 434A 12MO.

In total eighty-five plants were found and listed in the table (Table 10). Some are both medicinal plants and edible plants, such as peas (*Pisum sativum)* or rhubarb (*Rheum sp.*) or spices like cumin (*Cuminum cyminum*). It was not unexpected for the reasons mentioned earlier in this chapter.

2.1.3. Interpretation

Although presented as a list, the medicinal plants reported in the table are typically combined in the recipes. Few are effective when used on their own such as Hellebore (*Veratrum album*). According to the manuscript, its seeds can cure warts when rubbed on them. Another example would be Juniper (*Juniperus communis*). In case of toothache, it is recommended to "chew on the root of juniper; that takes away the pain and makes the tooth firm, and it also heals it" (Waggoner 2011, p9). Nevertheless, the plants are usually combined with other plants to complement each other's properties as well as animal products such as eggs and prayers. See the example of Hyssop (*Hyssopus officinalis*) and Plantain (*Plantago sp.*): "For the same,[31] take two spoonfuls of horehound, southernwood and hyssop with wine, and drink it for three days." (Waggoner 2011, p9); "For chills and fever, take wormwood and agrimony and plantain and meanwhile sing *Pater noster* and *Credo in deum* […]" (Waggoner 2011, p20). Moreover, one plant covers a wide range of conditions. Juniper is advised in case of toothache, but it also helps hair growth even though a different part of the plant is used.[32] Consequently, a question arises. Could the plants that cover the same conditions be substituted by one another?

The manuscript operates more as a guideline than a manual, given that its readers are presumably acquainted with herbalism. Thus, quantities and duration of the treatment are seldom mentioned. The prescription to relieve breast pain using the Southernwood and Hyssop

[31] In case of "pain in the breast".
[32] "For hair to grow, take juniper berries and olive oil and boil them in milk and rub on the head" (Waggoner 2011, p10).

drink is three days, for instance. The presence of numerous spices and vegetables in the list indicates the complex interlink between healing and edible plants, as well as the relevance of maintaining the humoral balance and having a healthy diet.

C/ Further analysis and discussion

1. Comparison of the data between the sites and interpretations

Naantali	Skriðuklaustur
Chelidonium majus	*Allium sp.*
Chenopodium album	*Borago officinalis*
Fragaria vesca	*Brassica sp.*
Galium sp.	*Betula pubescens*
Hordeum vulgare	*Galium verum*
Hyoscyamus niger	*Juniperus communis*
Juniperus communis	*Linum catharticum villilín*
Polygonum aviculare	*Plantago major*
Rubus idaeus	*Ranunculus acris*
Rumex acetosa	*Rhinanthus minor*
Stellaria media	*Sassafras albidium*
Spergula arvensis	*Thalictrium alpinum*
Trifolium repens	*Urtica dioica*
Vaccinium oxycoccos	*Urtica urens L.*

TABLE 11 LIST OF THE SELECTED MEDICINAL PLANTS FOUND AT THE MONASTERIES.

According to the selection criteria chosen for this study, *Juniperus communis* (Common Juniper) is present at both sites, as highlighted in green in table 11. Nevertheless, it is worth noting that other species, such as *Plantago major* and *Ranunculus acris*, are also present at the two sites (Table 12).

Latin names
Betula pubescens
Juniperus communis
Plantago major

Ranunculus acris
Rhinanthus minor
Urtica dioica

TABLE 12 LIST OF THE PLANT REMAINS PRESENT AT BOTH SITES IDENTIFIED AT THE SPECIES LEVEL.

At Naantali, only one seed of *Plantago major* and *Ranunculus acris* has been found. The low amount resulted in these species being excluded from the comparison table (Table 11). At Skriðuklaustur, the two species were found respectively as pollen and unspecified. Again, the quantity is unknown. I would specify that in the case of *Urtica dioica* and *Vaccinium oxycoccos* -listed in table 11 and 12- their presence is from layers post-medieval (Alanko 2017, 23). They were included in these tables as the focus was to list the plants with the highest count and presence at the site.

Naantali has more than triple the amount of -potential- medicinal plants than Skriðuklaustur monastery. An explanation may be that Naantali was located close to a town and was a pilgrimage site (see 1.1.1). Another reason may be Iceland's harsh climate, which makes it challenging to grow as much diversity of medicinal plants as in the rest of Europe.[33] Despite not being native to Iceland, some species present on the site were cultivated, such as *Brassica sp. Brassica sp.* is classified as a food plant by Steinunn Kristjánsdóttir, Inger Larsson and Per Avid Åsen (Kristjánsdóttir, Larsson and Åsen 2014, p570). However, this genus is known for its medicinal utilisation -like *Brassica nigra* (Black Mustard)- from both medieval written sources and more recent studies (*Läkebok* nr4, Ayadi *et al.* 2022). *Allium sp.* was a miracle and medicinal plant in the Nordics. Nevertheless, its presence, as pollen at Skriðuklaustur does not necessarily indicate that it was cultivated in Iceland (Kristjánsdóttir, Larsson and Åsen 2014, p570).

Also, the botanical remains found on the sites could have been used to alleviate a wide range of conditions and diseases. However, solely based on the archaeobotanical, it is not possible to know how the plants were mixed or what parts were used, especially since there are no mentions of distillation machinery being present at the monasteries, for instance. To assess the usage of the plants, the study of medieval medical manuscripts is essential (see V/B/3). Not only does it offer information about recipes but also about connection between ailments and cures. In a comparative perspective, it is possible to draw conclusions about herbal substitutions - i.e., different medicinal plants that were regarded as having similar medicinal properties.

[33] These two reasons may be complementary.

Despite being on Europe's periphery, the two sites show little in common from an archaeobotanical perspective. The overlap between the monasteries, in terms of grown/used plants is insignificant, which is surprising especially because Naantali has a total of 94 taxa, including 56 plants with potential medicinal properties (versus 14 plants at Skriðuklaustur). The sampling strategies employed at both sites are different, which may partly explain the difference. From a historical perspective, the monasteries did not belong to the same orders, Naantali served larger population and had higher financial means while Skriðuklaustur was exclusively masculine. However, a comparison is still possible since it is the species and the practice of herbal medicine that are the focus of the analysis. Medicinal plants' presence in the archaeobotanical records is not the sole focus of this thesis but also their presence in manuscripts.

2. Comparison of the data between the manuscripts and interpretations

The three manuscripts critically analysed in this thesis share several common points. First, they all operate more as guidelines for herbalism than educational manuals. Second, some plant remains are present either in the three manuscripts or at least in two of them (table 13 and 14).

Latin Names
Allium cepa
Allium sativum
Artemisia absinthum
Brassicaceae
Chelidonium majus
Crocus sativus
Juniperus communis
Mentha sp.
Rosa sp.
Salix sp.
Zingiber officinale

TABLE 13 LIST OF PLANTS PRESENT IN AT LEAST ONE SWEDISH MANUSCRIPT AND THE ICELANDIC ONE.

The plant remains that shared the same genus but were either not identified at the species level or did not have the same species were excluded from the table. Indeed, not all the species within a genus have potential medicinal properties, and some are used solely for food or

decoration (Gonçalves and Romano 2016, p213). In the table, although all have potential medicinal characteristics, not all are considered edible, such as *Chelidonium majus* (Great Celandine), *Juniperus communis* (Common Juniper), *Crocus sativus* (Saffron), *Salix sp.* (Willow), and *Artemisia absinthum* (Wormwood).

Most of the plants listed in the table have an overlap of two manuscripts out of three, i.e. *Läkebok* nr 5 and AM 434a 12mo. I suggest that the primary reason is the shortness of *Läkebok* nr 4. Another reason could be the high diversity of plants with potential medicinal properties, which may also indicate the limited therapeutic effect of the plants. Hence, their combination in recipes and overlapping properties.

The following recipes were extracted from *Läkebok* nr 4 and the Icelandic manuscript: For a headache, one should take southern wormwood and wormwood (*Läkebok* nr 4; personal translation); "Also for the same thing:[34] Place together a root of wormwood, male fern and ivy, and a white of an egg […]" (Waggoner 2011, p7). For the same ailment, i.e. a headache, the manuscripts, although they recommend wormwood, have different solutions. Nevertheless, southern wormwood and wormwood are believed to have pain-relieving properties (Batiha *et al.* 2020, p1; Ekiert *et al.* 2021, p2). Therefore, combining them may enhance their analgesic effect. The Icelandic recipe mixes wormwood with ivy. Today, the latter has been recognised to be effective in treating coughs (Barnes *et al.* 2020, p222). Thus, its presence in the Icelandic recipe may be for the pain-relieving qualities they believed ivy had or to change the consistency of the medication.

An interesting point is that all the plants *Läkebok* nr 4 and *Läkebok* nr 5 have in common are also present in AM 434a 12mo (Table 14). It could indicate that they were the most commonly used herbs in the Nordic countries during the late medieval period. A critical analysis of the archaeobotanical remains from Naantali and Skriðuklaustur may answer this hypothesis.

Latin names
Artemisia absinthium
Brassicaceae
Chelidonium majus
Juniperus communis

[34] A headache.

Rosa sp.

TABLE 14 PLANTS PRESENT IN THE TWO SWEDISH MANUSCRIPTS.

3. Analysis of the archaeobotanical data in perspective with the manuscripts

This study gathered data from five different sources: two excavated monasteries and three manuscripts, compiling 216 plants. However, only one species is present in every source: *Juniperus communis* (Common Juniper). If the focus is broadened to the genus level, then more crossovers emerge, as *Rumex* sp. or *Plantago* sp. may be added, for instance. Nonetheless, within a genus, different species may not have therapeutic effects. Certain plants are considered widespread weeds as well as possessing medicinal properties, an example being *Plantago sp.* This genus is present at both sites. However, it is mentioned in AM 434a 12mo and *Läkebok* nr 5 and identified as, potentially, *Plantago major*. Thus, its presence at the sites may be due to their first nature, i.e. weeds. On the other hand, some plants, such as *Zingiber officinale* (Ginger) are only mentioned in the manuscripts. Inherently, it does not imply that it was not used at all in the monasteries, especially since the spice is, to this day, used for its health benefits. Probably, it was not possible to identify it in the archaeobotanical assemblages.

After analysing the plant overlap between the sites and the assigned manuscripts, the results are not too dissimilar. At Skriðuklaustur's monastery, fourteen plants were identified as healing plants, while in AM 434a 12mo manuscript, eighty-five plants were reported. However, only two plants concur, i.e. *Allium* sp. (Allium; onion/garlic) and *Juniperus communis* (Common Juniper). Yet, one is not identified at the species level. Consequently, two hypotheses arise. First, the low overlap may be due to the poor preservation of the seeds on the site. Second, the readers of the manuscripts may not have cultivated the plants mentioned in it due to the harsh, windy climate and its closeness to the Arctic Circle. Thus, the manuscript acted as a general knowledge book.

Although not retrieved at Skriðuklaustur, *Chelidonium majus* (Great Calendine) was found in all the manuscripts and at Naantali. Therefore, it indicates that it was an important plant for its contemporaries. Its absence from Skriðuklaustur does not undo this point. A study conducted in another monastery, either in Nordic or continental Europe, may shed light on the importance of this plant in the art of healing since this plant is poisonous (Chiej 1984, p80).

Läkebok nr 4 and nr 5 have the same overlap with Naantali's monastery, i.e. *Chelidonium majus* (Great Celandine) and *Juniperus communis* (Common Juniper). These results are surprising since, despite being short, *Läkebok* nr 4 was written for the monastery. It

reinforces this idea that the herbals are educational guidelines rather than manuals to follow. Moreover, the excavation took place around the church and not in the garden, whose location is unknown (Alanko 2017, p4). Therefore, the results may have been slightly different.

VI/Conclusion

The study presented in this thesis sought to identify, compile, and compare medicinal plants from two Nordic medieval monasteries -Naantali and Skriðuklaustur, respectively, located in Finland and Iceland- in light with three medieval herbals from the same areas and period: *Läkebok* nr 4, *Läkebok* nr 5 and AM 434a 12mo. To add perspective and context to the study, the chapters preceding the analysis (V) focused on medieval medicine and medieval manuscripts in relation to the Church's contribution to knowledge production.

This thesis aimed to convey the benefits of a multidisciplinary approach. Combining archaeobotanical methods and historical sources is highly beneficial since each tackle a different aspect for studying medicinal practice. Indeed, archaeobotany may focus mainly on the identification of potential medicinal plants in archaeological contexts -here monastic complexes. The use of historical sources and approach concentrate on how medicinal plants were used and their role in societies. The two disciplines combined provided a greater understanding of herbalism in monastic complexes for the medieval period. The study of herbal medicine is crucial to further our comprehension of medieval societies, assess evolution and changes throughout the period as well as undo some stereotypes about medieval medicine, i.e. that it is “stupid, irrational, or downright barbaric” (Green 2009, p1220).

Despite the stereotypes and a lack of agreement on specific topics, such as the definition of medicine, the study of the history of medicine and herbal medicine progresses slowly and without a clear theoretical framework. The interdisciplinary nature of the field may explain it. Indeed, the medical industry, historians and archaeologists developed an interest in the history of medicine and herbal medicine. At first, in archaeology, a great emphasis was placed on archaeosteology to assess the field. Mainly after the 1950s, the study of -medieval herbal medicine developed along with archaeobotany. The research focuses primarily on how medieval individuals understood, cultivated, and used medicinal plants in their day-to-day practices as well as in cases of sickness (Murray 2008, p162; Kristjánsdóttir, Larsson and Åsen 2014; Watson and Gilchrist 2021, p2). Such studies in monastic complexes are relatively infrequent. Similarly, many herbal and medical manuscripts have been digitised and/or transcribed, but translations to modern languages, such as English or Swedish, are harder to find. Nonetheless, The *Old English Herbarium* or the Icelandic manuscript AM 434a 12mo are examples of translated herbals. The latter is analysed in this thesis.

The third chapter of the thesis expanded on the concepts of medicine -the study of the professionalisation of the craft and its theorisation- and healing -non-professional practice of

the arts of healing and the role of the sick. These concepts were put into perspective on a European and Nordic scale. On a European scale, medieval medicine presents common characteristics as well as regional variations. Some common traits include the prevalence of the humoral theory, the high diversity of practitioners and the slow rise of the professionalisation of the field and the Christian influence characterised by hospitals and monasteries. On a Nordic scale, some differences are worth pointing out such as the fewer numbers of university-trained practitioners and the later apparition of guilds and legislations. However, in Iceland, there was no organisation of health by a centralised power, which is due to its remoteness and few but scattered inhabitants. Despite the regional differences, herbalism was the pillar of medicine.

The fourth chapter of this thesis delved into the monastic institutions' central role in caring for the sick but also gathering, developing medical knowledge. It is illustrated by both the translation and production of medical texts such as *Läkebok* nr4 or *Liber Herbarum* as well as the cultivation of herbs (Kristjánsdóttir, Larsson and Åsen 2014; Gilchrist 2020, p73). The involvement of monasteries in healing practices decreased as the Middle Ages came to an end but the reasons remain unclear. Nonetheless, many historians, such as Roberta Gilchrist, ponder that the application of the Lateran Council law of 1215, which prevent clergy members from performing medicine, is the primary reasons to this decrease (Amundsen 1978, p40; Gilchrist 2020, p74).

The fifth chapter of this thesis consists of the comparative analysis of the data. The two sites provided insights into the practice of Medicine in monasteries.

Naantali, now in Finland, was part of Sweden when the monastic complex was established in the 15th century. It was an important monastery with a consequent amount of land and a hospital, most likely not within the monastic complex. The correlation of these two factors and the presence of a herbal written for Naantali's cloister suggests the practice of (herbal) medicine. An archaeobotanical study conducted at the site revealed numerous plants, including some believed to have therapeutic effects. In total, fifty-six remains were identified as plants with medicinal properties. Based on a counting system, only fourteen exceeded eleven seeds, making the data comparable with Skriðuklaustur.

The Icelandic monastery of Skriðuklaustur is located in the eastern part of the island. Founded at the very end of the 15th century, it closed down in 1552 after the Reformation. Thus, less than a century after it opened. An archaeobotanical study was conducted, revealing an infirmary hall but only fourteen plants with potential medicinal properties. In the same fashion as Naantali, these plants fall into different categories, such as tree fruits, cereals, and spices, for example.

In compilation and critical analysis of the plant remains, the two sites share one common plant identified at the species level. Nevertheless, by bypassing the limit of the fourteen most present plants for Naantali, an overlap of six plants was established. All identified at the species level, the six remains are: *Betula pubescens* (Downy Birch), *Juniperus communis* (Common Juniper), *Plantago major* (Common Plantain), *Ranunculus acris* (Meadow Buttercup), *Rhinanthus minor* (Yellow Rattle) and *Urtica dioica* (Stinging Nettle). It is difficult, solely based on archaeobotany, to know which plant properties were known to the medieval users. Therefore, a comparison with manuscripts is helpful. However, the plant remains identified in the manuscript have little overlap with the monasteries, while they include a considerable number of medicinal plants.

I was able to list sixty-two plants with potential medicinal properties in the two Swedish manuscripts, while the Icelandic one presents eighty-five. Despite the rather consequent number of plants listed, the comparison of the three manuscripts indicated eleven plants in common. Nevertheless, seven have been identified at the species level.

The lack of overlap between the sources is reinforced when comparing the archaeological sites and herbals. It highlights a significant contrast. Indeed, only one species is common to every source, i.e. *Juniperus communis* (Common Juniper). This result was not expected, as the five sources represent two-hundred and sixteen plant remains. However, this little crossover underlines the great diversity of plants with potential medicinal properties. Thus, further research could be conducted on a European scale, for instance.

Medicine and religion were intertwined, and some medicinal plants -and recipes more broadly- encapsulate religious symbols. Consequently, with the help of archaeobotany, one could investigate the extent to which manuscripts and monastic medicinal plants reflect and express the presence of biblical symbolism in monastic gardens. It could also explore to what extent the association of saints and certain plants led to the belief to have healing properties. Such investigation would enhance our understanding of medieval monastic medicine and medieval societies.

Bibliography

Agrawal, S., Yallatikar, T. and Gurjar, P. (2019) 'Brassica Nigra: Ethopharmacological Review of a Routinely Used Condiment', *Current Drug Discovery Technologies*, 16(1), pp. 40–47. Available at: https://doi.org/10.2174/1570163815666180308143400.

Ahmad, S. and Zeb, A. (2020) 'Phytochemical profile and pharmacological properties of Trifolium repens', *Journal of basic and clinical physiology and pharmacology*, 1. Available at: https://doi.org/10.1515/jbcpp-2020-0015.

Alanko, T. (2017) 'Cloister, manor and botanic gardens in medieval and early modern Finland and Sweden – An archaeobotanical approach to garden history'. Available at: https://www.academia.edu/32614828/Cloister_manor_and_botanic_gardens_in_medieval_and_early_modern_Finland_and_Sweden_An_archaeobotanical_approach_to_garden_history (Accessed: 12 March 2024).

Alanko, T. and Uotila, K. (2020) 'Gardening and consumption of plants in Naantali convent (SW Finland) before and after the Reformation', *Journal of Nordic Archaeological Science*, 19. Available at: https://www.academia.edu/68930973/Gardening_and_consumption_of_plants_in_Naantali_convent_SW_Finland_before_and_after_the_Reformation (Accessed: 27 July 2023).

Alford, J.A. (1979) 'Medicine in the Middle Ages: The Theory of a Profession', *The Centennial Review*, 23(4), pp. 377–396.

Amundsen, D.W. (1978) 'Medieval Canon Law on Medical and Surgical Practice by the Clergy', *Bulletin of the History of Medicine*, 52(1), pp. 22–44.

Arleskär, M. (2007) *Hospital och Helgeandshus : En studie av omsorgsväsende i medeltidens Sverige*. Sweden: Stockholm University. Available at: https://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-77696 (Accessed: 14 November 2023).

Ayadi, J. *et al.* (2022) 'Brassica Genus Seeds: A Review on Phytochemical Screening and Pharmacological Properties', *Molecules*, 27(18), p. 6008. Available at: https://doi.org/10.3390/molecules27186008.

Barbezat, M. (2022) 'An Herb for Speaking to The Dead: The Liturgical and Magical Life of Hyssop in The Latin Middle Ages', *Church History*, 91(3), pp. 492–512. Available at: https://doi.org/10.1017/S0009640722002153.

Barnes, L.A. *et al.* (2020) 'The effects of Hedera helix on viral respiratory infections in humans: A rapid review', *Advances in Integrative Medicine*, 7(4), pp. 222–226. Available at: https://doi.org/10.1016/j.aimed.2020.07.012.

Batiha, G.E.-S. *et al.* (2020) 'Bioactive Compounds, Pharmacological Actions, and Pharmacokinetics of Wormwood (Artemisia absinthium)', *Antibiotics*, 9(6), p. 353. Available at: https://doi.org/10.3390/antibiotics9060353.

Beck, B. (2000) 'Jardin monastique, jardin mystique. Ordonnance et signification des jardins monastiques médiévaux', *Revue d'Histoire de la Pharmacie*, 88(327), pp. 377–394. Available at: https://doi.org/10.3406/pharm.2000.5121.

Bello, O.M. *et al.* (2019) 'Wild vegetable *Rumex acetosa* Linn.: Its ethnobotany, pharmacology and phytochemistry – A review', *South African Journal of Botany*, 125, pp. 149–160. Available at: https://doi.org/10.1016/j.sajb.2019.04.018.

Benrahou, K. *et al.* (2023) 'Medicinal uses, phytochemistry, pharmacology, and taxonomy of Poygonum aviculare L.: a comprehensive review', *Medicinal Chemistry Research*, 32. Available at: https://doi.org/10.1007/s00044-023-03021-1.

Bergqvist, J. (2013) *Läkare och läkande : läkekonstens professionalisering i Sverige under medeltid och renässans*. Lund: Institutionen för arkeologi och antikens historia, Lunds Universitet. Available at: http://www.gbv.de/dms/ub-kiel/742434958.pdf (Accessed: 16 May 2024).

Bibeln (no date). Varberg: Argument förlag.

Blakeney, R. *et al.* (2023) 'Finding Medieval Medicine Through Archaeobotany: An Ontological Approach', *Environmental Archaeology*, 0(0), pp. 1–14. Available at: https://doi.org/10.1080/14614103.2023.2202933.

Boldsen, J. (2009) 'Leprosy in Medieval Denmark Osteological and epidemiological analyses', *Anthropologischer Anzeiger; Bericht über die biologisch-anthropologische Literatur*, 67, pp. 407–25. Available at: https://doi.org/10.1127/0003-5548/2009/0031.

Booth, C. (2018) 'Physician, Apothecary, or Surgeon? The Medieval Roots of Professional Boundaries in Later Medical Practice – The MHR', *Midlands Historical Review*, 2. Available at: http://www.midlandshistoricalreview.com/physician-apothecary-or-surgeon-the-medieval-roots-of-professional-boundaries-in-later-medical-practice/ (Accessed: 9 November 2023).

BORAGE: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews (no date). Available at: https://www.webmd.com/vitamins/ai/ingredientmono-596/borage (Accessed: 29 March 2024).

Bradic, J. *et al.* (2023) 'Lady's Bedstraw as a Powerful Antioxidant for Attenuation of Doxorubicin-Induced Cardiotoxicity', *Antioxidants*, 12(6), p. 1277. Available at: https://doi.org/10.3390/antiox12061277.

Brenner, E. (2016) 'Leprosy and Identity in the Middle Ages', in *The Routledge History of Disease*. 1st edn. United Kingdom: Routledge. Available at: https://www.tandfonline.com/doi/full/10.1080/14780038.2022.2082069 (Accessed: 19 May 2024).

Brenner, E. (2020) 'The Medical Role of Monasteries in the Latin West, c. 1050–1300', in. United Kingdom: Cambridge University Press, pp. 865–881. Available at: https://doi.org/10.1017/9781107323742.047.

Brodman, J. (2005) 'Medieval Hospitals', in *International Encyclopaedia for the Middle Ages*. Belgium: Brepols.

Brothwell, D.R. (1958) 'EVIDENCE OF LEPROSY IN BRITISH ARCHAEOLOGICAL MATERIAL', *Medical History*, 2(4), pp. 287–291. Available at: https://doi.org/10.1017/S0025727300023991.

Bullough, V.L. (1959) 'Training of the Nonuniversity-Educated Medical Practitioners in the Later Middle Ages', *Journal of the History of Medicine and Allied Sciences*, 14(4), pp. 446–458.

Bullough, V.L. (1966) *The Development of Medicine as a Profession: The Contribution of the Medieval University to Modern Medicine*. Germany: Karger.

Burdock, G.A. (2007) 'Safety assessment of castoreum extract as a food ingredient', *International Journal of Toxicology*, 26(1), pp. 51–55. Available at: https://doi.org/10.1080/10915810601120145.

Burridge, C. (2022) 'Healing Body and Soul in Early Medieval Europe: Medical Remedies with Christian Elements', *Studies in Church History*, 58, pp. 46–67. Available at: https://doi.org/10.1017/stc.2022.3.

Carlhed, C. (2013) 'The Rise of the Professional Field of Medicine in Sweden', *Professions and Professionalism*, 3(2). Available at: https://doi.org/10.7577/pp.562.

Casey, A. (2016) ‘Magic and Medicine in a Man’s World: The Medieval Woman as both Healer and Witch’, in. United States: University of North Carolina Asheville. Available at: https://www.semanticscholar.org/paper/Magic-and-Medicine-in-a-Man%27s-World%3A-The-Medieval-Casey/63ee057b348651784837b54945ef5d1474550d35 (Accessed: 18 November 2023).

Charron, C.S. and Novotny, J.A. (2016) ‘Garlic’, in *Encyclopaedia of food and health*. United States: Elsevier. Available at: https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/allium-sativum (Accessed: 29 March 2024).

Chiej, R. (1984) *The Macdonald Encyclopedia of Medicinal Plants*. UK: Macdonald.

Collins, C. (2018) ‘Heillog Bein, Brotin Bein: manifestations of disease in Medieval Iceland’, in E. Connelly and S. Künzel (eds) *New Approaches to Disease, Disability and Medicine in Medieval Europe*. Oxford: Archaeopress, pp. 109–125. Available at: https://centaur.reading.ac.uk/82374/ (Accessed: 21 February 2024).

Crespo, F. (1966) ‘Leprosy in Medieval Europe: An Immunological and Syndemic Approach’, in L. Jones and N. Varlik (eds) *Death and Disease in the Medieval and Early Modern World*. 1st edn. England: Boydell and Brewer Limited, pp. 295–318. Available at: https://doi.org/10.1017/9781800107861.012.

Davis, A.J. (2010) ‘Preaching in thirteenth-century hospitals’, *Journal of Medieval History*, 36(1), pp. 72–89. Available at: https://doi.org/10.1016/j.jmedhist.2009.12.002.

Davis, A.J. (2014) ‘The Social and Religious Meanings of Charity in Medieval Europe’, *History Compass*, 12(12), pp. 935–950. Available at: https://doi.org/10.1111/hic3.12207.

DeMaitre, L. (2013) *Medieval Medicine: The art of healing, from head to toe*. England: Bloomsbury Publishing. Available at: https://www.torrossa.com/en/resources/an/5531612 (Accessed: 7 February 2024).

DeWitte, S.N. (2014) ‘The Anthropology of Plague: Insights from Bioarcheological Analyses of Epidemic Cemeteries’, *The Medieval Globe*, 1(1).

Dickson, C. (1996) ‘Food, medicinal and other plants from the 15th century drains of Paisley Abbey, Scotland’, *Vegetation History and Archaeobotany*, 5(1), pp. 25–31. Available at: https://doi.org/10.1007/BF00189432.

Egnew, T.R. (2005) ‘The Meaning Of Healing: Transcending Suffering’, *Annals of Family Medicine*, 3(3), pp. 255–262. Available at: https://doi.org/10.1370/afm.313.

Ekiert, H. *et al.* (2021) 'Artemisia abrotanum L. (Southern Wormwood)-History, Current Knowledge on the Chemistry, Biological Activity, Traditional Use and Possible New Pharmaceutical and Cosmetological Applications', *Molecules (Basel, Switzerland)*, 26(9), p. 2503. Available at: https://doi.org/10.3390/molecules26092503.

Ferraris, Z.A. and Ferraris, V.A. (1997) 'The Women of Salerno: Contribution to the Origins of Surgery From Medieval Italy', *The Annals of Thoracic Surgery*, 64(6), pp. 1855–1857. Available at: https://doi.org/10.1016/S0003-4975(97)01079-5.

Foster, S. and Duke, J.A. (2000) *A Field Guide to Medicinal Plants and Herbs of Eastern and Central North America*. United States: Houghton Mifflin Harcourt.

Francia, S. and Stobart, A. (eds) (2014) *Critical Approaches to the History of Western Herbal Medicine: From Classical Antiquity to the Early Modern Period: Susan Francia: Bloomsbury Academic*. England: Bloomsbury Publishing. Available at: https://www.bloomsbury.com/uk/critical-approaches-to-the-history-of-western-herbal-medicine-9781441184184/ (Accessed: 18 May 2024).

Furniss, D.A. (1968) 'The monastic contribution to mediaeval medical care. Aspects of an earlier welfare state.', *The Journal of the Royal College of General Practitioners*, 15(4), pp. 244–250.

Gattiglia, G. *et al.* (2023) 'Palynology of Gardens and Archaeobotany for the Environmental Reconstruction of the Charterhouse of Calci-Pisa in Tuscany (Central Italy)', *Quaternary*, 6(3), p. 45. Available at: https://doi.org/10.3390/quat6030045.

Gilchrist, R. (ed.) (2020) *Sacred Heritage: Monastic Archaeology, Identities, Beliefs*. Cambridge: Cambridge University Press. Available at: https://doi.org/10.1017/9781108678087.004.

Gonçalves, S. and Romano, A. (2016) 'The medicinal potential of plants from the genus *Plantago* (Plantaginaceae)', *Industrial Crops and Products*, 83, pp. 213–226. Available at: https://doi.org/10.1016/j.indcrop.2015.12.038.

Green, M. (1989) 'Women's Medical Practice and Health Care in Medieval Europe', *Signs: Journal of Women in Culture and Society*, 14(2), pp. 434–473. Available at: https://doi.org/10.1086/494516.

Green, M.H. (2009) 'Integrative Medicine: Incorporating Medicine and Health into the Canon of Medieval European History', *History Compass*, 7(4), p. 1218.

Grésillon, É. (2007) ‘Le jardin religieux catholique’, *Géographie et cultures*, (60), pp. 77–92. Available at: https://doi.org/10.4000/gc.16169.

Hajar, R. (2012) ‘The Air of History (Part II) Medicine in the Middle Ages’, *Heart Views : The Official Journal of the Gulf Heart Association*, 13(4), pp. 158–162. Available at: https://doi.org/10.4103/1995-705X.105744.

Hausner, E.A. and Poppenga, R.H. (2013) ‘Hazards Associated with the Use of Herbal and Other Natural Products∗’, in M.E. Peterson and P.A. Talcott (eds) *Small Animal Toxicology (Third Edition)*. Saint Louis: W.B. Saunders, pp. 335–356. Available at: https://doi.org/10.1016/B978-1-4557-0717-1.00026-0.

Heimdahl, J. and Vretemark, M. (2018) ‘Oozing Ulcer: Herbal Cure the Medical Cultures of Nya Lödöse Reflected in Bones and Plants’, *International Journal of Historical Archaeology*, 22(2), pp. 314–342. Available at: https://doi.org/10.1007/s10761-017-0397-2.

Henricus Harpestreng - medieval (2012). Available at: http://wikihost.uib.no/medieval/index.php/Henricus_Harpestreng#.281.29_De_simplicibus_medicinis_laxativis (Accessed: 7 March 2024).

Ho, J.W. and Jie, M. (2007) ‘Pharmacological Activity of Cardiovascular Agents from Herbal Medicine’, *Cardiovascular & Hematological Agents in Medicinal Chemistry (Formerly*, 5(4), pp. 273–277. Available at: https://doi.org/10.2174/187152507782109854.

Holtom, J.A. and Hylton, W.H. (1979) *Complete Guide to Herbs*. F edition. Aylesbury: Rodale Press.

Horden, P. (2009) ‘What’s Wrong with Early Medieval Medicine? | Social History of Medicine | Oxford Academic’, *Social History of Medicine*, 24(1), p. 24.

Huggon, M. (2018) ‘Medieval medicine, public health, and the medieval hospital’, in *The Oxford Handbook of Later Medieval Archaeology in Britain*. Oxford: Oxford University Press, pp. 836–855. Available at: https://doi.org/10.1093/oxfordhb/9780198744719.013.34.

Inger, L. *et al.* (2012) *Medeltida klostergrunder på Island - vegetation och flora, kultur och reliktväxter, samtida växtnamn*. Landskapsarkitektur 12. Alnarp: Sveriges lantbruksuniversitet, p. 160.

Jouanna, J. (2012) ‘The Legacy of the Hippocratic Treatise The Nature of Man: The Theory of the Four Humours’, in *Greek Medicine from Hippocrates to Galen*. Leiden: Brill, pp. 335–359. Available at: https://doi.org/10.1163/9789004232549_017.

Judžentienė, A. (2016) ‘Hyssop (*Hyssopus officinalis* L.) Oils’, in V.R. Preedy (ed.) *Essential Oils in Food Preservation, Flavor and Safety*. San Diego: Academic Press, pp. 471–479. Available at: https://doi.org/10.1016/B978-0-12-416641-7.00053-5.

Jurikova, T. *et al.* (2018) ‘Bioactive Compounds, Antioxidant Activity, and Biological Effects of European Cranberry (Vaccinium oxycoccos)’, *Molecules*, 24(1), p. 24. Available at: https://doi.org/10.3390/molecules24010024.

Kapusta-Duch, J. *et al.* (2012) ‘The beneficial effects of Brassica vegetables on human health’, *Roczniki Panstwowego Zakladu Higieny*, 63(4), pp. 389–395.

Klemming, G.E. (1886) *Läke- och örte-böcker från Sveriges medeltid*. Stockholm : P. A. Norstedt och söner. Available at: http://archive.org/details/LakeochortebockerfranSveriges (Accessed: 7 March 2024).

Kristjánsdóttir, S. (2008) ‘Skriðuklaustur monastery: Medical centre of medieval east Iceland?’, *Acta Archaeologica*, 79(1), pp. 208–215. Available at: https://doi.org/10.1111/j.1600-0390.2008.00114.x.

Kristjánsdóttir, S. (2010) ‘The Tip of the Iceberg: The Material of Skriðuklaustur Monastery and Hospital’, *Norwegian Archaeological Review*, 43(1), pp. 44–62. Available at: https://doi.org/10.1080/00293651003798796.

Kristjánsdóttir, S., Larsson, I. and Åsen, P.A. (2014) ‘The Icelandic medieval monastic garden - did it exist?’, *Scandinavian Journal of History*, 39(5), pp. 560–579. Available at: https://doi.org/10.1080/03468755.2014.946534.

Kuiper, K. (2024) *Turku | Finnish City, Baltic Sea, Medieval Capital | Britannica*. Available at: https://www.britannica.com/place/Turku (Accessed: 14 March 2024).

Kumar, K.P.S., Bhowmik, D. and Tiwari, P. (2010) ‘Allium cepa: A traditional medicinal herb and its health benefits’, *Journal of Chemical and Pharmaceutical Research*, 2(1), pp. 283–291.

La Torre, C. *et al.* (2024) ‘Chemical Profile and Bioactivity of Rubus idaeus L. Fruits Grown in Conventional and Aeroponic Systems’, *Plants*, 13(8), p. 1115. Available at: https://doi.org/10.3390/plants13081115.

Larsson, I. (2013) ‘Beyond Byzantium. Swedish Medieval Herbalism and Plant Names’, *Acta Universitatis Upsaliensis. Studia sociologica Upsaliensia*, 13, pp. 185–209.

Liberal, J. *et al.* (2014) 'Bioactivity of *Fragaria vesca* leaves through inflammation, proteasome and autophagy modulation', *Journal of Ethnopharmacology*, 158, pp. 113–122. Available at: https://doi.org/10.1016/j.jep.2014.09.043.

Lindeblad, K. (2010) 'Lavendel, hjärtstilla och svarta vinbär. Om medeltida klosterträdgårdar i Östergötland.', in *Fokus Vreta Kloster: 17 nya rön om Sveriges äldsta kloster*. Stockholm: The Museum of National Antiquities, Stockholm, Studies 14, pp. 281–305. Available at: https://www.academia.edu/22136607/Lavendel_hj%C3%A4rtstilla_och_svarta_vinb%C3%A4r_Om_medeltida_klostertr%C3%A4dg%C3%A5rdar_i_%C3%96sterg%C3%B6tland (Accessed: 17 May 2024).

Lust, J. (1979) *The Herb Book*. Reissue edition. Bantam.

Mądra-Gackowska, K. *et al.* (2018) 'Medications of medieval monastery medicine', *Journal of Education, Health and Sport*, 8(9), pp. 2391–8306. Available at: https://doi.org/10.5281/zenodo.1438770.

Micke, O. *et al.* (2011) 'Traditional European Medicine : Hildegard von Bingen and beyond', *Trace elements and electrolytes*, 28(3), pp. 150–155.

Miller, T.S. and Nesbitt, J.W. (2014) *Walking Corpses: Leprosy in Byzantium and the Medieval West*. New York: Cornell University Press.

Murray Jones, P. (2008) 'Herbs and the Medieval Surgeon', in *Health and Healing from the Medieval Garden*. England: Boydell Press. Available at: https://www.cambridge.org/core/books/health-and-healing-from-the-medieval-garden/herbs-and-the-medieval-surgeon/8638005BBAFE686C7558B2128C58109E.

National Center for Biotechnology Information (no date). Available at: https://www.ncbi.nlm.nih.gov/ (Accessed: 21 March 2024).

Nordin, J. (2022) *Kodex: Boken i medeltidens Sverige*. Lund: Mediehistoriskt arkiv (Mediehistoriskt arkiv). Available at: https://doi.org/10.54292/b1vc20oock (Accessed: 5 March 2024).

Nutton, V. (2024) 'Galen', *Britannica*. Chicago: Encyclopædia Britannica, Inc. Available at: https://www.britannica.com/biography/Galen (Accessed: 13 February 2024).

Oladeji, O.S. and Oyebamiji, A.K. (2020) 'Stellaria media (L.) Vill.- A plant with immense therapeutic potentials: phytochemistry and pharmacology', *Heliyon*, 6(6), p. e04150. Available at: https://doi.org/10.1016/j.heliyon.2020.e04150.

Passos, I. and Mironidou-Tzouveleki, M. (2016) ‘Hallucinogenic Plants in the Mediterranean Countries’, in *Neuropathology of Drug Addictions and Substance Misuse*. United States: Elsevier, pp. 761–772. Available at: https://www.sciencedirect.com/topics/neuroscience/hyoscyamus-niger (Accessed: 22 March 2024).

Pálsson, Viðar "Personal communication.", University of Iceland, 2021.

Poonia, A. and Upadhayay, A. (2015) ‘Chenopodium album Linn: review of nutritive value and biological properties’, *Journal of Food Science and Technology*, 52(7), pp. 3977–3985. Available at: https://doi.org/10.1007/s13197-014-1553-x.

Raina, R. *et al.* (2019) ‘Potential of Juniperus communis L as a nutraceutical in human and veterinary medicine’, *Heliyon*, 5(8), p. e02376. Available at: https://doi.org/10.1016/j.heliyon.2019.e02376.

Reader, R. (1974) ‘New evidence for the antiquity of leprosy in early Britain’, *Journal of Archaeological Science*, 1(2), pp. 205–207. Available at: https://doi.org/10.1016/0305-4403(74)90043-0.

Regner, E. (2005) ‘Sigillstampar och gravar från Alvastra kloster’, *Fornvännen*, 100(3), pp. 193–200.

Riddell, S.J. *et al.* (2023) ‘The Potential of Palynology with Regard to the Archaeology of Medieval Monastery Sites in Iceland’, *Religions*, 14(5), p. 586. Available at: https://doi.org/10.3390/rel14050586.

Rojas-Vera, J., Patel, A.V. and Dacke, C.G. (2002) ‘Relaxant activity of raspberry (Rubus idaeus) leaf extract in guinea-pig ileum in vitro’, *Phytotherapy research: PTR*, 16(7), pp. 665–668. Available at: https://doi.org/10.1002/ptr.1040.

Sanderson, W. (1985) ‘The Plan of St. Gall Reconsidered’, *Speculum*, 60(3), pp. 615–632. Available at: https://doi.org/10.2307/2848178.

Schmid, T. (1951) ‘Medicinsk lärdom i det medeltida Sverige’, *Fornvännen*, pp. 309–339.

Scully, T. (2015) ‘A Cook’s Therapeutic Use of Garden Herbs’, in A. Touwaide and P. Dendle (eds) *Health and Healing from the Medieval Garden*. England: Boydell & Brewer, pp. 60–71. Available at: https://doi.org/10.1017/9781782044208.005.

Shaw, J. and Sykes, N. (2018) ‘New directions in the archaeology of medicine: deep-time approaches to human-animal-environmental care’, *World Archaeology*, 50(3), pp. 365–383. Available at: https://doi.org/10.1080/00438243.2018.1574393.

Shaw, P. (2012) *Analysis of soil samples from Skriðuklaustur I*. Archaeological excavation XXXIV. Reykjavík: Skriðuklaustursrannsóknir. Available at: https://steinunn.hi.is/is/rannsoknirresearch/skriduklaustur.

Singh, H., Singh, D. and Lekhak, M.M. (2023) ‘Ethnobotany, botany, phytochemistry and ethnopharmacology of the genus Thalictrum L. (Ranunculaceae): A review’, *Journal of Ethnopharmacology*, 305, p. 115950. Available at: https://doi.org/10.1016/j.jep.2022.115950.

Siraisi, N.G. (2009) ‘Practitioners and conditions of practice’, in *Medieval and Early Renaissance Medicine: An Introduction to Knowledge and Practice*. United States: University of Chicago Press.

Smith, D. (2014) ‘Medicinal Herbs and Medieval Healthcare at Skriðuklaustur Monastery, East Iceland’, *International Journal of Humanities and Social Science*, 4(13), p. 5.

Smith, M. and Peregrine, P. (2012) ‘Approaches to Comparative Analysis in Archaeology’, in *The Comparative Archaeology of Complex Societies*. United Kingdom: Cambridge University Press, pp. 4–20. Available at: https://doi.org/10.1017/CBO9781139022712.004.

Stearns, J. (2021) ‘Disease: Confronting, Consoling and Constructing the Afflicted Body’, in I. McCleery (ed.) *A Cultural History of Medicine in the Middle Ages*. 1st edn. London: Bloomsbury Publishing, p. 63. Available at: https://www.academia.edu/48945862/Disease_Confronting_Consoling_and_Constructing_the_Afflicted_Body_Proofs_ (Accessed: 13 November 2023).

Strabo, W. (2008) *ON THE CULTIVATION OF GARDENS*. San Francisco: ITHURIELS SPEAR. Available at: https://www.academia.edu/26634764/ON_THE_CULTIVATION_OF_GARDENS_WALAFRID_STRABO.

Sundarapandian, M., Thekkekkara, D. and Nanjan, M.J. (2016) ‘Nutritional assessment of the plant, Spergula arvensis L.’, *Indian Journal of Natural Products and Resources*, 7(2).

Sykes, N. and Shaw, J. (2022) *The Archaeology of Medicine and Healthcare*. United Kingdom: Taylor & Francis.

Tilly, C. (1984) *Big Structures, Large Processes, Huge Comparisons*. Russell Sage Foundation. Available at: https://www.jstor.org/stable/10.7758/9781610447720 (Accessed: 24 January 2024).

Tirosh, Y. and Crocker, C. (2021) 'Health, Healing, and the Social Body in Medieval Iceland', in *Understanding Disability Throughout History*. 1st edn. United Kingdom: Routledge, pp. 113–127.

Turcov, D. *et al.* (2022) 'Antioxidants from Galium verum as Ingredients for the Design of New Dermatocosmetic Products', *Plants*, 11(19), p. 2454. Available at: https://doi.org/10.3390/plants11192454.

Urtica Dioica - an overview (no date) *Science Direct*. Available at: https://www.sciencedirect.com/topics/immunology-and-microbiology/urtica-dioica (Accessed: 29 March 2024).

Van Arsdall, A. (2023) *Medieval Herbal Remedies: The Old English Herbarium and Early-Medieval Medicine*. United Kingdom: Taylor & Francis.

Van der Veen, M. (2018) 'Archaeobotany: The Archaeology of Human-Plant Interactions', in W. Scheidel (ed.) *The Science of Roman History*. United Kingdom: Princeton University Press, pp. 53–95. Available at: https://doi.org/10.23943/princeton/9780691195988.003.0003.

Vandtorpe, P. and Jacomet, S. (2007) 'Published by Maney Publishing (c) Association of Environmental ArchaeologyComparing different pre-treatment methods for strongly compacted organic sediments prior to wet-sieving: a case study on Roman waterlogged deposits', *Maney*, 12(2). Available at: https://doi.org/DOI 10.1179/174963107x226462.

Waggoner, B. (2011) *Norse Magical and Herbal Healing: A medieval book from Iceland*. United States: Troth Publications.

Wallis, F. (2010) *Medieval Medicine: A Reader*. Canada: University of Toronto Press.

Watson, G.L. and Gilchrist, R. (2021) 'Objects: the archaeology of medieval healing', in I. McCleery (ed.) *A Cultural History of Medicine in the Middle Ages (800-1450)*. 1st edn. London: Bloomsbury Publishing (A CULTURAL HISTORY SERIES), pp. 107–129. Available at: https://centaur.reading.ac.uk/102336/ (Accessed: 5 May 2024).

Watt, S. and Hayes, E. (2013) 'Monastic medicine: medieval herbalism meets modern science', *Science in School*, (27), p. 7.

Zhang, L. *et al.* (2021) 'Phytochemical Constituents and Biological Activities of the Unexplored Plant Rhinanthus angustifolius subsp. grandiflorus', *Applied Sciences*, 11(19), p. 9162. Available at: https://doi.org/10.3390/app11199162.

Zielińska, S. *et al.* (2018) 'Greater Celandine's Ups and Downs−21 Centuries of Medicinal Uses of Chelidonium majus From the Viewpoint of Today's Pharmacology', *Frontiers in Pharmacology*, 9, p. 299. Available at: https://doi.org/10.3389/fphar.2018.00299.