OSTEOBIOGRAPHY OF VICAR RUNGIUS
ANALYSES OF THE BONES AND TISSUES OF THE MUMMY OF AN EARLY 17TH-CENTURY NORTHERN FINNISH CLERGYMAN USING RADIOLOGY AND STABLE ISOTOPES

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OSTEOBIOGRAPHY OF VICAR RUNGIUS
Analyses of the bones and tissues of the mummy of an early 17th-century Northern Finnish clergyman using radiology and stable isotopes

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Abstract
This dissertation is a pioneering effort in a project to document, preserve and study the human remains found beneath old Northern Finnish churches. These remains have spontaneously mummified as a result of the early modern elite’s practice of burying under church floors. The main subject of the study is an early 17th-century Vicar of the Kemi parish, Nikolaus Rungius, and his mummified remains. His mummy that still is an important tourist attraction and a popular character in local lore, has a unique history as it has been exhibited since the 18th-century.

The computed tomography scanning performed on the mummy revealed pathological findings suggesting that the Vicar suffered from obesity-related conditions. The most convincing of these was the manifestation of DISH in his thoracic spine. There were also indications of tuberculosis, such as a probable Pott’s spine, as well as calcifications, for example, in subareolar regions. The latter may also represent gynaecomastia, which currently is a rather common finding in elderly men.

The scans also provided information concerning the preservation. In addition to the right forearm that was lost by the mid-19th-century, six cervical vertebrae are missing. The head still appears to be attached through a continuous band of soft tissue, and has likely belonged to the same person as the rest of the body.

Both the Vicar’s dental health examined through the scans, and the results of the stable isotope analyses (δ13C, δ15N) of his nail keratin, along with the obesity-related findings, indicated a rather heavy diet rich in protein. This is in line with what is known about the early modern Northern Finnish diets. They were mainly based on foodstuffs acquired by hunting, fishing and animal husbandry. These interpretations also comport with the Vicar’s status, and assumed wealth. Typically, the clergy could maintain abundant diets. Even manifestations of DISH are rather commonly found in remains from monastery sites.

The Vicar’s δ15N value was elevated in comparison to the values of the control group comprised of other early modern human remains in Northern Finnish churches. This discrepancy may be due to a stronger input of dietary protein sourced from top aquatic predators, such as the seal. Another plausible explanation could be the connection between the elevated δ15N value and DISH previously found by several authors.

Keywords: church archaeology, computed tomography, mummification, Northern Finland, paleopathology, stable isotopes
Väre, Tiina, Kirkkoherra Rungiuksen osteobiografia. 1600-luvulla eläneen pohjoissuomalaisen kirkonmiehen luiden ja muumioituneiden kudosten radiologinen ja stabiliisotooppeihin perustuva analyysi
Oulun yliopiston tutkijakoulu; Oulun yliopisto, Humanistinen tiedekunta, Arkeologia
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Oulun yliopisto, PL 8000, 90014 Oulun yliopisto

Tiivistelmä


Stabiiliisotooppi analyysit paillivat kirkkoherran tyypin merkittävästi muista pohjoissuomalaisista muumioista koostuvan verrokkiaineiston arvoja korkeammaksi. Ero selittyni ravinnon suuremmalla määrällä vesistöjen hiippusäästöistä, kuten hylkeiden proteiineista. Toinen mahdollinen selitys on liittyä kohomeiden tyyppiarvojen ja DISHin välillä aiemmin löydetyn yhteyteen.

Asiasanat: kirkkoarkeologia, muumioituminen, paleopatologia, Pohjois-Suomi, stabiliisotoopit, tietokonetomografia
…så sannt denna arm och hela min kropp efter min död icke skall förvandlas till stoft och aska, utan förblifva hel till domedagen, förbarmar sig vår Herre öfver oss och fuktar jorden före solens nedgång, om edra böner äro allvarliga och i förenen dem med mina.¹

¹ Nikolaus Rungius according to Jacob Fellman (1906, 324)
Acknowledgements

In 2011, after the computed tomography imaging of Vicar Rungius’s mummified remains, I began working on his life story. Already during the same year, the initial imaging results were published in the Festschrift in honour of PhD Kirsti Paavola. In fact, her research on church graves is what inspired us to study the remains found in Finnish churches, and me to continue working with this dissertation study. What is more, her work offered important guidance during its completion.

Over the past six years, I have received help from many sources. To begin with, I want to express my gratitude to my supervisors, Doc. Juho-Antti Junno and Doc. Markku Niskanen, who have guided me along my way towards the doctoral degree. In addition, I am grateful to Prof. Em. Milton Núñez, who, as my unofficial mentor, has encouraged and supported me in finding the needed insight. During the course of my work, I also participated in a mentoring program organized by my graduate school. What I took with me from that experience is a new and clearer perspective in regard to my future career. For that I thank my appointed mentor Prof. Katja Porvari. I also want to thank my dissertation committee, Doc. Anna-Kaisa Salmi and Prof. Petri Lehenkari, and my preliminary reviewers, Prof. Andrew Chamberlain and MD, Doc. Heikki S. Vuorinen.

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I also want to express my gratitude to the parishes of Keminmaa, Kempele and Haukipudas for enabling the whole project. Especially, the collaboration with the former vicar of the Keminmaa parish, Yrjö Haapala, has been crucially important.

Furthermore, I would like to thank all the instances that have offered me financial support during the years of research. These are the Faculty of Humanities of University of Oulu, Oulu University Scholarship Foundation, University of Oulu Graduate School, Yliopiston Apteenkin rahasto Fund, Anna Esteri Timola Fund and Emil Aaltonen Foundation. In addition, I have received support and encouragement from the co-workers in my other places of employment during the preparation of my thesis.

Last, but definitely not the least, I want to thank my friends and family. I am thankful to every single person who has given me their time by allowing me to talk...
— often endlessly, and sometimes during the most unsuitable of moments — about the topic of my research. By patiently letting me reflect on my thoughts you have offered me an opportunity to sharpen my perspective.

Thank you, MA Karen Wethered Niskanen, Janna Kinnunen and Cathaoir Sóna for helping me with my English — Sinikka Saarenpää, Hanna Hautala and Anna Linna for reading, and commenting on my texts, and Riikka Harjula, Emilia Attias, Tiina Haapapuro, and many others, for offering me valuable words of encouragement. Perhaps above all, I am grateful to Teppo Pekkala for bringing joy to my life otherwise consumed by research. My soon 92-year-old grandmother, Mrs. Lyyli Väre, a native to the Kemi region — thank you for once familiarizing the 12-year-old me with the legends of Vicar Rungius. My brother, Lauri Väre, who helped me with the climate-data, and my parents, Anneli and Kari Väre, who offered me irreplaceable and always available childcare: Thank you for believing in me.

Finally, the person to whom I am most thankful is my dear daughter, beautiful and witty Ms. Irina Heikkilä. She, as well, will one day achieve her goals and dreams. Ultimately, she is the reason why I ever started this journey.

Valentine’s Day, 2017

Tiina Väre
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>$\delta^{13}C$</td>
<td>Ratio of stable isotopes carbon-13 and carbon-12 ($^{13}C/^{12}C$).</td>
</tr>
<tr>
<td>$\delta^{15}N$</td>
<td>Ratio of stable isotopes nitrogen-15 and nitrogen-14 ($^{15}N/^{14}N$).</td>
</tr>
<tr>
<td>$^\circ C$</td>
<td>Celcius, a unit of measure for temperature. In absolute scale $0^\circ C$ is equivalent to 273.15 K.</td>
</tr>
<tr>
<td>%rH</td>
<td>Relative humidity. RH of 100% means that the air is saturated with water.</td>
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<tr>
<td>approx.</td>
<td>approximately</td>
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<tr>
<td>BIB</td>
<td>bi-iliac breath, the maximum breath between the spines of ilia when in anatomical position</td>
</tr>
<tr>
<td>c.</td>
<td>circa</td>
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<tr>
<td>DISH</td>
<td>diffuse idiopathic skeletal hyperostosis, Forestier's disease</td>
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<tr>
<td>e.g.</td>
<td>exempli gratia, for example</td>
</tr>
<tr>
<td>HisKi</td>
<td>Suomen sukututkimusseuran Historiakirjat, Hiski Project, a digital database of church registers by Genealogical Society of Finland.</td>
</tr>
<tr>
<td>HU</td>
<td>Hounsfield Units, a unit radiodensity</td>
</tr>
<tr>
<td>MTBC</td>
<td><em>Mycobacterium tuberculosis complex</em>, which is the group of pathogens causing tuberculosis.</td>
</tr>
<tr>
<td>N</td>
<td>number (of individuals/cases)</td>
</tr>
<tr>
<td>OA</td>
<td>osteoarthritis</td>
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<tr>
<td>OSF</td>
<td>Official Statistics of Finland</td>
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<tr>
<td>$p$</td>
<td>probability</td>
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<tr>
<td>SAOB</td>
<td>Svenska Akademiens ordbok, The Swedish Academy Dictionary</td>
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<tr>
<td>SIA</td>
<td>stable isotope analysis</td>
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<tr>
<td>Stat.</td>
<td>stature</td>
</tr>
<tr>
<td>TB</td>
<td>tuberculosis</td>
</tr>
<tr>
<td>UAB</td>
<td>Universidad Autónoma de Barcelona, Autonomous University of Barcelona</td>
</tr>
<tr>
<td>vs.</td>
<td>versus</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<td>yrs.</td>
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Original publications

This thesis is based on the following publications, which are referred to throughout the text by their Roman numerals:


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1 Introduction

From the Middle Ages until the late 18th century, the members of the elite were customarily buried beneath the parish churches in Finland. At first, mainly the clergymen were considered worthy of such graves. Later, the control over the qualifications of candidacy was loosened, and purchasing a grave in church became especially popular during the 17th and 18th centuries. Burying the deceased in actively used churches became less common by the late 18th century, and the practice was finally banned in 1822. (Kuusisto 1929, 72; Talve 1989, 58; Lempiäinen 1990a, 8, 11; Lempiäinen 1990b, 69; Paavola 1998, 36–43.) Nevertheless, the last church graves can be dated to as late as the turn of the 20th century, although by then they were mainly placed in churches that were no longer in active service. (Cajanus 1927, 30; Satokangas 1997a, 428, 599–600).

In the cool and well-ventilated base floors of churches, sheltered from the elements, some of the buried remains underwent spontaneous mummification (Núñez, Paavola & García-Guixé 2008, 126–127). To this day, mummified human remains can be found under several Finnish churches built prior to the mid-18th century, when the custom began slowly to fade (e. g. Hiekkari 1988, 69; Joona 1997; Joona et al. 1997; Joona & Ojanlatva 1997a; Kangasvuo & Pöppönen 1997; Marjomaa & Ruokoski 1997; Tikkala 1997a; Tikkala 1997b; Suvanto 2005).

These remains hold a particular legacy, but are also especially important to the Finnish bioanthropological research, as sufficient long-term preservation of even the skeletal material is generally poor in the local soils. The bedrock is rich in silicon dioxide-based granite and gneiss which makes the soil acidic (Tattari & Rekolainen 2006, 27; Spellman 2009, 50). This, in turn, accelerates the breakdown of buried bone tissues (Gordon & Buikstra 1981). Moreover, in contrast to the human remains usually found in archaeological contexts, mummification preserves all the skeletal elements in correct articulation. Thus, these remains offer a unique opportunity to study the early modern people and funerary traditions in the northern periphery of Europe.

Nikolaus Rungius (Fig. 1) is perhaps the best-known individual in Finland, whose remains, subsequent to a burial in a church, have gone through a natural process of mummification. He was an early 17th-century vicar of the Kemi parish, who acquired a rather impressive posthumous fame largely attributable to the remarkable preservation of his remains. Apparently since the 18th century, these remains have been exhibited in the old church of Keminmaa to interested visitors (Huurre 1983; Kallinen 1990, 129). Vicar Rungius is the main character of several
local stories that mostly address the reason for his mummification. However, the actual contemporaneous records that either pertain his remains or which would unveil reliable information about his life are rare. Thus, the general aim of this dissertation is to recount the osteobiography of Vicar Rungius, as well as to illuminate the unusual afterlife of his remains by utilizing computed tomography (CT) and stable isotope analyses. An additional objective is to connect the information concerning the Vicar to his contemporaneous context in order to further clarify the realm of the early 17th-century Northern Finland. The study was conducted as a part of a project set out to preserve, document and examine the mummified remains found beneath old Northern Finnish churches.

Fig. 1. The mummified remains of Vicar Nikolaus Rungius.

Some of the terms and concepts used in this study need clarification. For instance, due to the historical events, some place names may cause confusion when considered from a modern perspective. To begin, the church, under which Vicar Rungius was once buried, and where his remains are still exhibited, is currently called the old church of Keminmaa (Fig. 2). The municipality was, however, not always called Keminmaa. Until 1979, it was known as Kemin maalaiskunta\(^2\) to

\(^2\) This roughly translates as the rural municipality of Kemi.
separate it from the City of Kemi founded in 1869, and located less than 10 km south of the church. Before the two parishes were divided in 1902, together they formed the historical parish of Kemi (Hedman 1969, 99). Hence, the name Kemi is used whenever referring to the parish once led by Vicar Rungius. Currently, however, Kemi is the name of the city parish, while the old church belongs to the separate parish of Keminmaa.

Fig. 2. The old stone church of Keminmaa is situated near the current Swedish border in the delta of River Kemi in Finnish Lapland. During Vicar Rungius’s tenure, Kemi was a geographically large, but sparsely populated parish. However, the region was not isolated. A lively market place located in the vicinity of the stone church gathered merchants and commoners from near and far. (Hedman 1969, 50, 159–167; Virrankoski 1973, 15, 25, 161, 166)

The names of the modern nations of Finland and Sweden are another issue that may cause confusion. Although the roots of Sweden go far back in to history, Finland as a separate country has at present only existed for less than hundred years. Until the end of the Finnish War in 1809, the country now known as the Republic of Finland was a part of the Swedish Kingdom, and constituted over one third of its acreage.
After this, the area became the autonomous Grand Duchy of Finland within the Russian Empire for a period of slightly more than a hundred years before gaining its independence on 6 December 1917. However, when the terms Finland or Finnish are used in this study, they refer to the early modern equivalents of the approximate geographic area of the modern Republic of Finland and of its population. This is in spite of the fact that, at the time, such concepts hardly existed, or at least were probably not fully applicable to the localities and populations that form the focus of this study.

1.1 Research questions and the composition of the study

This dissertation combines five individual research articles (p. 13) of which four have been published in peer reviewer journals. One will be attached as a manuscript to be published later. These articles consider issues such as the preservation, authenticity, and the local significance of the mummy, but also the stories that have arisen concerning its origins. Moreover, the anthropometric measurements and pathological findings examined through the CT imaging are given consideration. In addition, the nutrition indicated by the latter two, in combination with the results of the stable isotope analyses, is discussed. The following research questions offer a guide for this study:

1. What is the mummy’s significance to the parish and to local people, and is it likely that the mummy is authentic?
2. How was the health of Vicar Rungius before his death in 1629, and how did any possible health issues he might have had compound with the common diseases during his time?
3. What kind of diet did Vicar Rungius have, and is it comparable with the common Northern Finnish diet of the time? Does his diet give any indications of his status as a clergyman?
4. What does his state of health tell about his diet?

One aim of the CT imaging was to conclude about the preservation of human remains in church graves in more detail. At the same time, the scanning served to preserve the rather unique mumified remains of an early 17th-century clergyman in digital form, even in the event of the remains decomposing.

Initially, the study of the remains progressed reflectively. In particular, foreseeing what kind of pathological findings would emerge in the scans was essentially impossible. First of all, once the thoracic vertebral lesion of
inflammatory origin was found, suspicions of tuberculous involvement arose. Consequently, what implications the potential infection would have had on the Vicar were elaborated upon, as was the history of tuberculosis (TB) in Northern Finland. Similarly, the detected diffuse idiopathic skeletal hyperostosis (DISH) manifestations suggesting a rather heavy diet gave reason to consider his nutrition, which led to the utilization of the stable isotope analyses – a methodology that in simple terms is based on the fact that we are what we eat. By the same token, the concept of socially constructed diets offered a viewpoint for addressing the results of the dietary study. The need to express oneself, and to differentiate between social classes may become visible through distinguished dietary choices (e.g. Counihan 1999, 7–9; Scholliers 2001, 3–4). Vicar Rungius’s diet, and through that, even his state of health, may have been tied to his rank, and thus, socially defined.

Moreover, the surprise offered by finding that nearly all the cervical vertebrae were missing took the discussion concerning the authenticity of the remains into a new direction. This finally led to an examination of the meanings the mummy with a long history of exhibition has been given through juxtaposing it with the more traditional monuments and memorials often representing stability and local identity (see e.g. Alderman & Dwyer 2009, 51–52, 56; Knapp 2009, 47–49).

1.2 Ethics

The study of Vicar Rungius’s remains, as well as the whole project of preserving, documenting and investigating the mummified remains buried beneath old Northern Finnish churches was conducted according to the commonly accepted guidelines established for researching human remains in bioanthropological and archaeological settings (Code of ethics - BABAO). Further support for any ethical considerations was sought from the more recent instructions prepared by a team of Finnish researchers3. They are specialized in the utilization of clinical subjects, and archaeological remains in research, and have a better understanding of the local circumstances and characteristics related to medical or bioanthropological study.

In any research involving human remains, a specific consideration of ethical issues is a requirement. To begin with, it is always important to maintain a respectful demeanour towards the study subjects by means of a proper and dignified handling of their remains or any data concerning them. Of course, this also applies

to the remains of Vicar Rungius. Furthermore, although a thorough bioanthropological study of the Finnish mummified human remains could enlighten us about the living conditions of the past, following a promising start the project has been hindered by various practical and intertwined ethical issues. The main problems faced are the fragility of the mummified tissues combined with rotten coffin materials, as well as the confined spaces beneath the churches. These have unduly complicated the procedures related to any further CT studies.

The identities of some of the deceased resting beneath the studied churches are already known, but out of ethical concerns, no further identification was attempted at this stage. Although this study may produce information that might be of interest to the living relatives of those once buried beneath the church floors, the purpose is not to draw connections to posterity. Controversially, the local people, as well as genealogists, are typically interested in identifying the remains (Paavola 2012, 109–110). However, especially while studying such deeply personal aspects of the subjects’ lives as their bodily functions or state of health, the importance of maintaining their anonymity is even more relevant. As for the remains of Vicar Rungius, their unusual history puts them in a slightly different category both in terms of research and in relation to ethical considerations. Strictly refraining from scientific research would perhaps further emphasize the curio-nature to which they have been subjected over the centuries.

Finally, the benefits of this study should also be pondered while making ethical considerations. At best, the information gained from the palaeopathological research has relevance in the field of medicine (see e.g. Roberts & Manchester 2010, 6). Additionally, the studies relating to mummification and preservation contribute to the field of forensic science.

1.3 Subjects and methods

During the course of this multidisciplinary study, the methods of natural science and medicine were combined under bioarchaeological themes. As mentioned earlier, Vicar Rungius’s mummified remains were CT scanned to find out about his preservation, anthropometric parameters, and any possible pathological lesions, but also in order to document and preserve their attributes digitally in a three-dimensional form. Such procedures allow one to return to the subject without physically revisiting the mummy. Hence, they ensure better conservation of the study subject. This imaging served as a pilot study to test the CT method for a later,
more extensive, non-invasive examination of mummified remains in Finnish churches.

Biomedical imaging was not the only method employed in this study. Stable isotope ratios of carbon and nitrogen in the nail and hair keratin of several mummified individuals were also analysed in order to gain an insight into the early modern diets in the northern periphery of Europe. The mummified human remains in the old church of Keminmaa and in the church of Haukipudas served as a control population, while, in the context of this dissertation, the primary aim was to reach a conclusion about the Vicar’s diet. Most of the studied individuals presumably date to the 18th and 19th centuries with the exception of Vicar Rungius himself.

Both methods, CT imaging and stable isotope analyses, are already common in mummy research internationally (e.g. Macko et al. 1999; Thekkaniyil, Bishara & James 2000; Nerlich et al. 2015; Gerloni et al. 2009; Panzer, Piombino-Mascali & Zink 2012; Lynnerup 2010). This dissertation, however, is the first to apply them to the study of the naturally formed Northern Finnish mummies.

1.3.1 Computed tomography of the remains of Vicar Rungius

An invasive autopsy that would have destroyed the mummy was not an option when choosing the method for an internal examination of Vicar Rungius’s mummy – nor will it be in the studies of any other mummified remains found in Northern Finnish church graves. However, utilizing the available medical imaging methods, such an examination could be conducted rather effectively.

The chosen method of computed tomography (CT, computerized axial tomography [CAT]) scanning creates three-dimensional reconstructions of the studied objects using two-dimensional cross-sectional X-ray images perpendicular to the axis of the imaging system. The method is based on the differences in the densities of various tissues. These densities can be calculated from the qualities of the X-ray beams projected through the studied object. Hounsfield Units (HU) are used to determine the density of the studied materials. The HU scale is a linear transformation of the measured attenuation in which water is defined as 0 HU and air -1000 HU. Certain mathematical algorithms transform the obtained information into digital images that comprise of matrix of pixels, which in turn form voxels.

The CT imaging took place on 2 April 2011 at Oulu University Hospital and it required transporting the remains of Vicar Rungius from Keminmaa to Oulu (Fig. 2) – which constitutes a journey of more than 100 km. The mummy travelled, and
was imaged inside its current coffin containing a mattress and pillow, which both made the procedure safer in terms of the inviolability of the remains.

The study was carried through utilizing the clinical 64-slice CT scanner (Discovery 690, General Electric Medical Systems, Milwaukee, WI, USA) of Oulu University Hospital. The scan protocol was performed using the parameters of slice collimation 0.625 mm, X-ray tube rotation time 0.5 s, X-ray tube voltage 120 kV, X-ray tube current 400 mA, and standard reconstruction kernel with a field of view of 665 mm and an image matrix of 512 × 512. This resulted in image voxels the size of 1.3 mm × 1.3 mm × 0.6 mm. The obtained images were analysed by a radiologist using a 3-dimensional Advantage Windows 4.6 clinical workstation (General Electric Medical Systems, Milwaukee, WI, USA), and OsiriX Imaging Software for clinical use. (Niinimäki et al. 2011, 268; Väre et al. 2011; I; II; III; IV)

1.3.2 Palaeopathological observations

The ancient diseases of both humans and animals are subjects of palaeopathological research. Typically, while studying the human diseases of the past, the material consists of skeletonized individuals, but sometimes of mummified tissues as well. Additionally, artistic depictions, or artefacts related to healing and health care may be utilized as source material. Naturally, the written history of medicine is also used in palaeopathological problem solving. However, these sources at best cover merely fractions of the co-existence of humans and their diseases.

External examination

The mummified remains of Vicar Rungius are currently resting in a glass-lid coffin by the chancellery in the north-easter corner of the old church of Keminmaa. His coffin is located below floor-level and under trapdoors (Fig. 1), which are held open for the tourists in the summer time. In the winter, the church is closed to the public. Before the remains were transported to the CT study in Oulu, their external features and attributes were superficially examined on site and documented using digital photography.

Once at the hospital, prior to the radiological imaging, a re-examination and further photographing was conducted in better light conditions. This investigation was done to assess the overall appearance and preservation of the mummy, but also to detect any signs of pathological lesions, as well as other abnormal changes or peculiar anatomical features visible to naked eye (II).
Examination of the scans

The parameters of scan protocol provided resolution, which enabled the observation of the main physical measurements and the detection of fairly small details, such as many pathological conditions. A corresponding method was used in the study of the Iceman Ötzi’s general, as well as dental, health (Pernter et al. 2007; Seiler et al. 2013). However, the thinner slice collimation used in the study of the remains of Vicar Rungius (0.625 mm vs. 0.75 mm) produced even better resolution in the cranio-caudal direction.

The scans were scrutinized for any possible findings suggesting general pathological processes in either the skeletal, or soft-tissues (II; III). In the skeletal tissues, the disease processes can basically either cause proliferation, destruction or both simultaneously. These changes result as various conditions affect the equilibrium of the osteoblasts and osteoclasts forming and breaking down living bone tissue. Therefore, the palaeopathological diagnoses, as opposed to isolated lesions, are typically based on the pattern of lesions. (e.g. Roberts & Manchester 2010, 5–7.) In similar fashion to the internal pathological examination, the Vicar’s oral health was also studied solely via the CT scans. Any conventional dental health examination methods were prevented by the mouth being permanently closed due to the mummification of the surrounding facial tissues (Fig. 1; IV).

1.3.3 Estimating the body size

The body size of Vicar Rungius was estimated in the scans by utilizing the measuring functions of the chosen software (II). To begin with, the maximum length from the mummy’s exposed bregma to the bottom of the heel bones (calcanei) was measured. This measurement, however, does not reflect the actual living stature of Vicar Rungius. Some degree of correction was in order due to factors relating to taphonomic changes, such as missing skeletal elements or shrinkage caused by mummification.4

The obtained stature estimation (Stat) was then used in the reconstruction of the Vicar’s body weight (II). The stature and the maximal breadth measured between both iliac spines while in anatomical position (bi-iliac breadth, BIB) allowed for an estimate of ideal body weight. The following equation (1) developed by Ruff et al. (2005) was utilized to arrive at such an estimate.

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4 See pp. 68–69.
Body weight = 0.422 × Stat + 3.126 × (living) BIB – 92.9 (r = 0.913, SEE = 3.7)  
(1)

Due to soft tissue shrinkage, the bi-iliac breadth measured from the scans represents a skeletal, and not a living, bi-iliac breadth, and thus, must be converted. The following equation (2) introduced by Ruff et al. (1997) allows for such a conversion.

\[
\text{Living BIB} = 1.17 \times \text{skeletal BIB} – 3 \text{ cm} 
\]  
(2)

Naturally, such an estimation of ideal body weight does not account for the variation in the amount of muscle mass or adipose tissue, which both strongly correspond to the type of nutrition, health, and even lifestyle choices.

1.3.4 Estimating the age at death

Initially, the suture closures of the mummy’s exposed cranium (Fig. 1) were used in attempt to substantiate the previously assumed age at death (II). Nevertheless, as this method is notoriously imprecise and unreliable, further confirmation was required. Another commonly used aging method, based on the age-related morphological changes in pubic symphysis, was selected in effort to establish a more accurate skeletal age for the remains believed to be those of Vicar Rungius, who supposedly died in his seventies. A matching age estimation could be used further to confirm the identity of the remains.

The Suchey-Brooks sex-specific aging system for adult skeleton (Brooks & Suchey 1990) describes the early and late stage average expressions in the opposing symphyseal faces of the pubis in six separate age phases. The first phase represents the early post-adolescence when the furrows and ridges of the billowing surfaces are regular and evenly aligned. In short, as a person ages, the regular billowing starts to disappear and it is first replaced by a smoother symphyseal face, although ossification nodules may develop. Especially towards the later phases, the proceeding erratic ossification results in the surfaces becoming irregular, pitted, and porous. In addition to the descriptions, the licenced male pubic symphysis plaster casts (France Casting Trademark, Bellevue, CO) were used as a reference.
The method has previously been successfully applied on CT scanned materials (Telmon et al. 2005; Wink 2014; Dedouit et al. 2008).

As a further example, the auricular surfaces of the ilia are anatomical structures that exhibit certain age-related changes (Lovejoy et al. 1985; Barrier 2009), and the extent of dental wear is typically evaluated when estimating the age of an individual (e.g. Miles 2001). These methods were, however, discarded as the auricular surfaces could not be properly examined in the scans, and the resolution was not sufficient to ensure adequately reliable results in the observation of dental wear. However, it should be acknowledged that finding out the Vicar’s precise age at death is beyond the capacity of current age-estimation methods, as the remains are clearly those of a mature individual.

1.3.5 Stable isotope analyses

Subjects and study material

In 2013 and 2014, small tissue samples were taken of the remains of Vicar Rungius and those of a control population of 12 other individuals buried beneath the old churches of Keminmaa (2) and Haukipudas (10). These samples were utilized in stable isotope analyses to gather information about the local early modern diets (V). They were reconstructed by looking at the relative frequencies of stable isotopes carbon-13 and carbon-12, as well as nitrogen-14 and nitrogen-15 in nail and hair keratin or both depending on the subject’s preservation. The samples consisted of hair of varying length, nail clippings and complete nails. The sample of Vicar Rungius consisted of his whole left great toe nail. It takes approximately six months to a year for a toe nail to grow fully (Yaemsiri et al. 2010). This means that his nail sample revealed his diet approximately at the same time period prior to his death. Unfortunately, no Vicar’s hair had preserved and sampling his bone, which would have provided a more holistic view of the diet, proved unsuccessful.

The reference population consisted of six adults, two children and four infants. They were not contemporaneous with Vicar Rungius, as those buried in Keminmaa had died during the 19th century, while the preserved burials in Haukipudas are mostly from the 18th century, although the oldest could be from the 1640s. All analysed individuals were presumably members of higher social strata as only they could obtain a church grave by and large. However, the societies in the observed parishes were not very hierarchical. (Paavola 1998, 67, 87, 119, 263; Koskela 1997,
Nevertheless, the vicar’s position was typically special in terms of wealth and status (Virrankoski 1973, 687).

During the studied period, both Kemi and Haukipudas were small townships. They are located about 80 km apart by the mouths of the River Kemi and River Kiiminki on the north-easter coast of the Gulf of Bothnia. Kemi, which was a lively market place known for its rich fisheries. Kemi was also a particularly important harbour for the exportation of fish and other goods from Finnish Lapland, while Haukipudas was a slightly smaller township. (Hedman 1969, 159–164; Vahtola 1980, 11, 47; 1997a, 113; Satokangas 1997b, 181).

**Method**

The ratio of the stable nitrogen isotopes 14 and 15 (δ15N) shows the subject’s trophic level, as the obtained value is enriched by approx. +3.4 ±1.1% with each trophic step (Minagawa & Wada 1984). The carbon values (ratio between carbon-13 and carbon-12, δ13C) are used to trace the C3 and C4 plants in the diet, though here this is irrelevant as C4 plants, such as maize or millet, do not naturally grow in the Nordic region and by this time were probably not imported to the area in significant quantities. Another application of δ13C value is tracing the marine or terrestrial origin of the diet consumed by the analysed organisms.

Both hair and nail samples were prepared by using a modified version of the protocols for keratin introduced by O’Connell & Hedges (1999) and von Holstein et al. (2013). They were analysed in the stable isotope laboratory at the Department of Geological Science of the University of Stockholm using a CarloErba NC2500 elemental analyser linked to a Finnigan MAT Delta+ mass spectrometer. The values were then corrected in accordance with the recommendations of O’Connell & Hedges (1999) in order for them to be comparable with the more commonly used collagen analyses. (Arosén 2014)

All collected samples were analysed, but when there were more than one sample from the same individual, the mean of both values was used to avoid statistical overrepresentation. The atomic carbon-to-nitrogen ratio in all samples fell within 3.3–3.6 (Arosén 2014, 15–16), while values anywhere between 3.0 and 3.8 C/N are acceptable for a keratin sample (O’Connell & Hedges 1999). The result of one hair sample of an individual from Haukipudas was discarded, because the δ15N analysis had most likely failed (6.5‰ vs. 10.9–14.6‰) as the same individual’s nail sample pointed towards much higher value (13.2‰) which was similar to those of the rest of the studied population. (Arosén 2014)
Finally, two-tailed Independent Samples Tests (IBM SPSS Statistics 24) were utilized to determine whether the individuals from both localities were similar, and whether Vicar Rungius’s diet was any different from those of the other mummified individuals.
2 Background

2.1 Church burial practice

2.1.1 Temporal aspect of the practice

The custom of burying the deceased near or beneath sacral buildings originates in the second century Church’s Cult of Martyrs set out by the persecutions of Christians. Believers began burying their dead around the gravesites of martyrs, on which many early churches were later built. Eventually, this tradition led to the custom of burying the dead under the floors of these, and later also other churches. (Nilsson 1989, 37–40, 155; Lempiäinen 1990a, 7)

Christianity arrived in Finland rather late. The coastal and insular Southwestern Finland were the first to go through the gradual transition to the new religion. From the Bronze Age until the 11th century, cremation had been the standard form of funerary rite, but such a way of disposing of a dead body fitted poorly with the new beliefs. The transition to inhumations from the 11th century onwards took place approximately at the same time the east-west burial orientation became widespread. Slightly later, the mundane utensils given as grave goods were discarded, or replaced by smaller items bearing Christian symbols. (e.g. Rinne 1941, 5–6; Hirviliitto 1987, 119, 125–126; Lehtosalo-Hilander 1989, 28; Huhtala 1989, 41–42; Lempiäinen 1990a, 8; Purhonen 1992, 404–405, 412; 1997, 373; Solli 1995, 28–29; Salo 1997, 341)

The first evidence of burials under churches in Finland date to the 13th century. Initially they were uncommon, and only granted to the men of the cloth, and occasionally to other important members of the society. Soon, however, even other members of the elite were considered eligible to claim a gravesite in church. (Rinne 1941, 53–54; Nilsson 1989, 156; Paavola 1998, 36.) Yet, burials in churches likely remained relatively rare in number until the 17th century, but became substantially more common during it. Nevertheless, it was only in the next century, which also witnessed a rapid population growth, that the custom reached the peak of its popularity. (Pihlman 1989; 78, 80; Lempiäinen 1990a, 11; Paavola 1998, 38–40, 46.)

The custom had also raised controversy practically from the beginning. The Early Church Fathers took positions on the issue of who, if anyone at all, was entitled to be buried inside a church. Several restrictions were issued, especially
between the 6th and 12th centuries, although the debate had been on-going for quite some time. (Nilsson 1989, 156.) Thus, the custom had been considered problematic long before the Christianity ever gained a foothold in Finland. In that country, from the 17th century onwards, the lack of space beneath the mostly rather small churches was the main cause of dispute. Yet, already by the beginning of the next century, the odour of decomposing bodies began increasingly to draw the attention of the officials. Consequently, orders were given to make the burials deep enough, carefully to cover them, and to seal the tombs with clay and lime after each burial. (Kuusisto 1929, 74, 78; Juva 1955, 113; Rimpiläinen 1971, 334; Lempiäinen 1990b, 68–69; Paavola 1998, 31, 39–42.)

The rules and regulations concerning the burials were often neglected. Moreover, the problematic smells, and the lack of space were intertwined as the confined spaces prevented from reaching the required depth without disturbing the previous burials. As a consequence, the old remains were often cleared out in a rather reckless way – sometimes even leaving them uncovered on the churchyard. Furthermore, the layer of soil covering the graves frequently remained too shallow to conceal the smells. (Kuusisto 1929, 76–78; Cajanus 1927, 31–32; Virrankoski 1973, 677–678; Paavola 1998, 112, 157.)

These problems were naturally exacerbated as the popularity of the custom grew out of proportion with the 18th-century population growth, which subsequently increased the demand for church graves. By this time, in many parishes, the only requirement for getting such a grave was financial. Not only to solve the problem of overcrowding, but also to enhance the parish economy, the burial fees were raised in many parishes. (Kuusisto 1929, 79; Juva 1955, 113, 181; Hiekkonen 1988, 68; Pihlman 1989, 78; Paavola 1998, 39–40.) There were, however, differences between parishes in how strongly the burial place reflected the social standing. Although commoners were mostly buried in the churchyard, there was considerable variation between the centuries and the parishes in the matter of who could acquire a grave beneath a church. On some occasions, the qualifications were stricter, while other parishes, especially those in the countryside, were not very hierarchical. (Juva 1955, 113, 181; Paavola 1998, 46, 119, 263.)

During the second half of the 18th century, the increasing opposition resulted in more stringent controls over the custom. By then, the unhealthiness of having the dead close to the living was recognized. According to the miasma theory, which was popular at the time, the foul smells rising from the graves were believed to poison the air, which as a result would transmit diseases. (Kuusisto 1929, 78–79; Hiekkonen 1988, 69; Paavola 1998, 40–42, 112.) Although this theory is unfounded,
the flies breeding in the graves did infest the churches, especially in summertime, and could, indeed, carry disease-provoking pathogens from the poorly covered graves (Hiekkanen 1988, 68). Moreover, the harm that the repeated burials, and the dust ascending from beneath the floor caused to the churches’ structures advocated for the prohibition of the custom (Kuusisto 1929, 76; Juva 1955, 181; Hiekkanen 1988, 68–69; Paavola 1998, 40).

Especially during the 18th century, the Pietistic movements, which emphasized virtues of modesty and humility, disapproved of the lavishness of the church burials (Paavola 1998, 42). These developments resulted in local and regional restrictions in eligibility for purchasing a church grave. Often, all members of lower social strata were excluded, but deaths inflicted by epidemics could cause an impediment even for members of the elite. (Kuusisto 1929, 73–74, 79–81, 83; Juva 1955, 181; Lempiäinen 1990a, 11; Paavola 1998, 112–114.)

As early as in the 1779 diet of Sweden, the clergy ineffectively proposed banning the custom. Their concerns were, however, soon acknowledged, as in 1783, the King of Sweden banned the selling of new plots in churches, and subsequently the custom gradually began losing its appeal. (Lindahl 1969, 198–200, 202; Paavola 1998, 43.) For example, in Northern Ostrobothnia, burials beneath churches were mostly discontinued by the end of the 18th century. Renovations of old churches, as well as the construction of new ones frequently led to the logical termination of the practice locally. (Paavola 1998, 112–115.) Yet, the centuries-old practice was not totally eradicated. For example, in 1795 buying a grave even under the Stockholm Cathedral was still possible for a distinctive member of the clergy. Curiously, priests, who had been the first to oppose the practice, were often the last to be buried in churches. (Ahonen 1990, 233; Paavola 1998; 42–43, 117.)

In the Swedish Kingdom, burials beneath churches were banned in 1815. This no longer concerned the former province of Finland, as after the Finnish War (1808–1809), the area was surrendered to the Russian Empire. Nevertheless, a similar prohibition was issued in Finland less than a decade later, in 1822. (Lempiäinen 1990a, 11; Lempiäinen 1990b, 69)

Even the national prohibition proved somewhat ineffective in wiping out the historically popular practice. Although already prohibited decades before, in an 1845 legal proposal, the prohibition of burials beneath churches was again brought up (Förslag till Kyrkolag 1845, 173; Paavola 1998, 43). Later, the health statute of 1879 also banned temporary winter burials in churches (Lempiäinen 1990b, 69). In some parishes, the burials continued – especially in churches no longer in active use – even until the 20th century (Cajanus 1927, 30). According to the local lore,
2.1.2 The social, religious and economic significance

In the past, funerals were important social occasions in the Swedish Kingdom, and no expenses were spared in organizing them (Kuusisto 1929, 73; Juva 1955, 69–70, 181; Regnard 1982 [1731], 108; Sarmela 1994, 57). The location of the grave was significant. The currently used cemeteries apart from the parish’s church only became common in the 19th century (Talve 1989, 59; Lempiäinen 1990a, 9, 12). Before this, the most wanted plots were located as near as possible to the church, or preferably inside it. The church undoubtedly was the epicentre of the early modern social existence (e.g. Pihlman 1989, 80–81; Maaranen 2002). The graves sheltered by churches were expensive, and usually mainly attainable by the members of the elite either entitled to such a burial because of the nature of their occupation, or otherwise eligible due to their pedigree, wealth or status. Beneath the church, the precise location of the grave was significant, as well. Like the seating plan above the floor, the order of the graves below it also reflected the social hierarchy. The site showed the rank of the individual, and hence, the social standing of the whole family. The most valued and expensive grave sites were below the altar in the east. (Kuusisto 1929, 72, 74–76; Juva 1955, 69–70, 113; Rimpiläinen 1971: 72–73, 333–334; Talve 1989, 57–58, 62; Pihlman 1989, 78; Lempiäinen 1990a, 8; Paavola 1998, 40, 46, 173, 175–176.)

The popularity of the custom can be explained in various ways. To begin with, especially following the Catholic period, the maintenance of the churchyards was generally poor. Even domestic animals, such as pigs and dogs, could roam around on them and feed on the human remains in the hastily covered graves. Thus, it was only below the church that the peaceful rest of the deceased was ensured. (Cajanus 1927, 31; Kuusisto 1929, 72, 76–77; Juva 1955, 69; Virrankoski 1973, 676–678; Hiekkanen 1988, 68; Lempiäinen 1990a, 11; Paavola 1998, 46, 112, 167.) Some have, however, suggested that the poor maintenance was more of a consequence than a cause of popularity of these burials. Once the solvent members of the parish buried their dead in churches, maintaining the churchyards was mostly left to the poor parishioners with insufficient means to fulfil the task adequately. (Talve 1989, 58; Paavola 1998, 46.)

Early on in the Christian doctrine, the separation between body and soul had been less than straightforward. While the dogma does not necessarily promote the
resurrection of the body – at least not in its realistic form – the common beliefs indicated a much more pragmatic understanding of the concept. Therefore, what happened to the dead body was not something people were indifferent about. (Rimpiläinen 1971, 223; Solli 1995, 28; Paavola 1998, 34–35, 44, 166) For example, in Christian graveyards, the deceased were systematically buried in an east-west orientation in supine position. This was because according to tradition, the Sun of Resurrection awaking the dead on the Judgement Day can most effortlessly be seen while actually positioned to face it. (e.g. Lempiäinen 1990a, 8, 18; Solli 1995, 28)

Officially, the Church did not unambiguously promote burials beneath churches either. Dogmatically, the grave site was considered insignificant in terms of salvation. Thus, the custom based on the common beliefs called for theological justification. In Catholic Church, the original motive for burying near sites dedicated to martyrs – later mostly churches – was that the deceased would be protected by them in the afterlife, and that being close to praying parishioners would intensify their intercessions for the benefit of the souls of the deceased. (Nilsson 1989, 37–41, 155; Lempiäinen 1990a, 7; Paavola 1998, 32.) However, after the Protestant Reformation in the 16th century, burials beneath churches were already customary and their motives perhaps no longer discussed. (Paavola 1998, 37.)

Ultimately, revenue made selling these graves emerged as an essential motive for the Church to allow them. In many parishes, they served as the most profitable source of income. As mentioned, a gravesite in a church was considered more prestigious, and was consequently more expensive than a regular churchyard plot. This was probably the main reason to let the practice to continue as long as it did. Although originally the rank of the individual or family was relevant in determining eligibility, by the mid-18th century in many parishes, solvency had become the only qualification for candidacy. (Juva 1955, 69–70, 89, 113; Hiekkanen 1988, 68; Lempiäinen 1990a, 11; Paavola 1998, 34, 40.) By then, the raised fees were also used to restrain the popularity of the custom, but as a gravesite in a church stood for an instantaneous improvement in social status, such an investment was especially important for the members of lower strata of the society. Hence, raising the price was not necessarily a very effective restraint. (Juva 1955, 180; Pihlman 1989, 78)

There were, however, other reasons as well to keep allowing the practice besides the parish economy. The parishioners who had already purchased a gravesite were reluctant to give up their investments. It was also difficult to dissolve
the social constructions behind this practice, which had been an efficient way of distinguishing between different social classes. Acquiring an expensive gravesite offered an opportunity to show off one’s wealth and to strengthen the social standing of the family. To emphasize such an impact, elaborate monuments and sarcophaguses rising above the churches’ floor level, and even disturbing the services, were favoured among the highest elite in larger churches. In addition to, or perhaps even instead of faith, a burial inside a church now manifested more secular virtues. (Kuusisto 1929, 73, 83; Juva 1955, 181; Rimpiläinen 1971, 334; Hiekkonen 1988, 68–69; Talve 1989, 58; Paavola 1998, 40, 42, 46.) Moreover, the practicality of church graves during the winter when the ground was frozen solid, as well as the parishes’ unwillingness to give up space reserved for burials when the churchyards were full, kept the practice alive. (Cajanus 1927, 30; Kuusisto 1929, 77; Paavola 1998, 40, 46, 115, 262.)

The question of whether the church burials were made to enable mummification still remains. If so, then the practice links to a nearly universal tradition of preserving the remains of the dead, which has independently developed in various cultures across the globe (e.g. Aufderheide 2010; Jeremiah 2012, 38–39). In Christian contexts, the belief in divine intervention, as well as bodily resurrection, and the concept of the soul lingering around the corpse, may partially explain the custom (Paavola 1998, 146–147, 166, 262; Piombino-Mascali et al. 2010, 357; Jeremiah 2014, 94). This interpretation necessitates the assumption that the people were aware of the mummification taking place in the church graves. It, indeed, was often possible to see the previously deceased while depositing new burials. On top of that, the older burials were regularly removed, and redeposited in the churchyards to make room inside the packed premises. (Kuusisto 1929; 77; Paavola 1998, 147, 162, 165–166.) Even crypt tours presenting either the lavish graves, or even what lay inside, were not uncommon (Olsson 1956, 18–19). Although some coffins were sealed, others were equipped with opening mechanisms. These were, however, probably originally installed to enable the wakes, and not necessarily meant to be used by the curious posterity – or even the heralds of the Judgement Day. (Ojanlatva 1997, 1; Koskela 1997, 8–9; Paavola 1998, 147, 162, 262)

2.1.3 The old church of Keminmaa

Consolidation of Christianity did not take place simultaneously in all parts of Finland. Whereas by the turn of the second millennium, the heartlands in the south were the first to be influenced by the new religion, it took several centuries to spread
the message to the northernmost part of Lapland. There were, however, exceptions that show a relatively early impact in the North. The missionary work was mostly targeted to the regions relevant to the contemporaneous economic and political struggle for power. For example, the establishment of the parish in Kemi as early as in the 14th century, at latest, perhaps demonstrates the importance that this location once had. Due to the ongoing contest between Sweden and Novgorod to conquer their interjacent regions, bloody encounters were common there. (e.g. Mäkivuoti 1982, 61; Vahtola 1982, 115–118: 130; Koivunen 1997a, 40; Koivunen 1997b, 41–43; Hiekkanen 2014, 508)

The old stone church of Keminmaa (Church of St Michael; Fig. 2) stands on the western bank of River Kemi close to its delta region. It is the third or fourth church of the historical Kemi parish. At least two earlier wooden churches were located in Valmarinniemi, which is a peninsula poking into the river about 3 km downstream from the old stone church. The first church was probably constructed by as early as the mid-14th century. (Koivunen 1982, 40–41; Hiekkanen 2014, 509.) As a document – albeit with susceptible provenance (Mäkivuoti 1982, 65) – dating back as early as 1320s mentions Kemi parish, the first church may even have been some decades older. In any case, it was burned down by the 1420s during a military expedition from Novgorod. The second was probably built in 1431 at the same approximate location, and subsequently burned in a 1517 – again during an attack by eastern troops. (Castrén 1894, 56; Cajanus 1927, 8; Koivunen 1982, 41; Koivunen 1997b, 44–47; Hiekkanen 2014, 509.) In 1981, an excavation at the site of these churches revealed 151 inhumations, the majority of which were in an east-west orientation, thus indicating a Christian influence. (Koivunen 1982, 45, 49; Koivunen 1997b, 44–45.)

After the demolition of the last wooden church in 1517, the new one was built of stone on a different and perhaps better protected or otherwise more suitable site upstream. (Koivunen 1982, 40–41; Koivunen 1997b, 47; Hiekkanen 2014, 509). The building was completed in phases (Hiekkanen 2014, 508). Previously, it was thought to have been in service as far back as in the early 1520s (Calamnius 1868, 201; Castrén 1894, 57; Paavola 1998, 28; Koivunen 1982, 40; Koivunen 1997b, 48). However, according to Hiekkanen (2014, 509–510), this was when the decision to build it was made, and the actual construction work would have begun as late as in the 1550s. This in turn would suggest that between the one burned in 1517, and the still-existing old stone church, there may have been yet another church in Kemi (see also Oikelmus 1984 [1950], 65; Hiekkanen 2014, 509). However, no further evidence has been found so far.
In the 1981 excavation in Valmarinniemi, some of the burials were found inside the remnants of the churches’ foundations. Although it is uncertain whether they were originally made inside the churches, or if they preceded the buildings, these burials may substantiate the first church graves in the late medieval period Kemi. (Koivunen 1997b, 45; Paavola 2009, 241.) In the archives, the first records of the church graves date to as late as 1698, although the first individual known to have been buried in the old church is Vicar Nikolaus Rungius, who died in 1629. It is, however, likely that the clergymen preceding him in that office were buried beneath the parish’s churches as well. However, between 1698 and 1784, which is when the last burial took place in the old church during its active use, a minimum of nearly a hundred individuals were buried there. Following the general trend, the attitudes toward the custom had become increasingly negative during the 18th century: already after 1768, there was a long break in burials (Paavola 1997, 4; 1998, 40–43, 77–78; 2009, 242, 244).

By the late 18th century, the old stone church had become too small for the growing parish, and a new church was inaugurated in 1799. Due to construction flaws, it was replaced already in 1827 by the Keminmaa parish’s current church. (Castrén 1894, 57–58; Hiekkanen 2014, 510.) These new churches were not used for burials, although their completion did not end the practice. After the old stone church was no longer in active service, the burials inside it were continued. (Cajanus 1927, 29–30; Paavola 1997, 2; 1998, 86; 2009, 244.) Despite the national 1822 prohibition, the 1845 official reminder of the previous imposition, the parish’s separate 1871 decision to ban burials in the unused church, and even the 1879 health statute forbidding contemporary graves, the practice went on up until the turn of 20th century (Förslag till Kyrkolag 1845, 173; Cajanus 1927, 30; Lempiäinen 1990b, 69; Satokangas 1997a, 599–600; Paavola 1998, 43, 86–87; 2009, 246).)

By the time the new church was built, it was likely that the symbolism once connected to the church graves had largely disappeared. Now the church was no longer seen as a permanent location for the deceased, but used as a temporary winter depository due to difficulties in opening new graves in frozen ground. By then, the old stone church had practically been emptied of furniture, which was reused in the new church. Thus, instead of being buried in the soils beneath the church, the coffins were now piled up on the floor. Following each winter, half of the floor space was typically covered by the coffins. In spring, the relatives were expected to bury those who had died during winter, but they often failed to fulfil this duty, even on pain of penalty (Cajanus 1927, 30). Hence, some of the burials
were never removed. Presumably, a majority of the remaining coffins in the church date to the 19th century, and according to some of the preserved epitaphs, the deceased within them mostly represent the elite of this period. (Paavola 1997, 2; 1998, 86–87; 2009, 242–247)

The old church was refurnished in 1957. After this, it regained part of its former glory once its summertime use began. (Itkonen 1976, 20)

### 2.2 Mummification mechanisms

Decomposition begins immediately after death by an enzyme-induced autolysis causing autodigestion and liquefaction of tissues. Several enzymes are important to post-mortem processes in breaking down the large molecules. Autolysis is followed by putrefaction initiated by endo- and exogenous bacteria segregating enzymes to dissolve the soft tissues for their nutrition. The bacterial activity accumulates gases bloating the corpse. The flies arrive to lay eggs, and their maggots feast on the flesh. They are followed by beetles using mostly the fly eggs as nutrition. Finally – especially if the corpse is left unburied, the odours attract larger scavenging species to consume it. (Laiho 1981, 135–136, 139; Fiedler & Graw 2003; Aufderheide 2010, 41–42; Prahlow 2010, 169–177.)

Typically, in a grave, the soft tissue decomposes in up to 5 years although fat remains within bones much longer. The process ends in the chemical dissolution of the skeletal tissue, which may take millennia. However, the destruction or preservation of the corpse is highly dependent on the various environmental factors which cause considerable temporal fluctuation in various parts of the process. Moreover, the internal factors afflict the decomposition rate, as for example, **perimortem** infections may hasten it. (Laiho 1981, 135–137, 139; Fiedler & Graw 2003; Aufderheide 2010, 41–42; Prahlow 2010, 169–177.) Changes in environmental circumstances at any time during the process may virtually cause the soft tissue decomposition to cease causing mummification. This can be artificially induced, enhanced, or it may happen naturally. Whether the mummification had been anthropogenic, cannot always be determined. (Aufderheide 2010, 41.)

Various factors, either separately or in cooperation, may cause inhibition of the enzyme action. In the case of the mumified remains located beneath Northern Finnish churches, it is mainly temperature, humidity and ventilation that need to be considered. The optimal functioning of enzymes requires water. Thus, the desiccation of soft tissue is a rather efficient mechanism of mummification. The
evaporation of moisture can be aided by ventilation, for example, that is provided by the uninsulated church base-floors. In addition, covering the burial with porous, dry sand removes moisture from the corpse. The temperature effects the enzyme and bacterial action as the intestinal bacterial fauna ceases to multiply in temperatures below 4°C. Even sublimation caused by freezing can result in desiccation. (Laiho 1981, 137; Núñez, Paavola & García-Guixé 2008, 126–127; Aufderheide 2010, 42–45, 48, 61.) Mummification is also more common in bacteria-poor small infants, and especially in foetuses. Body size affects the likelihood, as thin individuals desiccate more quickly. Moreover, tissue types decompose at different rates; while intestines often vanish rapidly, the skin remains leaving behind an empty darkened leathery crust. As a further example, extremities are more prone to mummify. (Laiho 1981, 137; Dix & Graham 2000, 13–14; Janaway, Percival & Wilson 2009, 329; Prahlow 2010, 175, 177.)

Mummified human remains usually raise considerable popular interest. There are various examples of them from all over the globe, from the 9,000-year-old natural Chinchorro mummies of the arid Atacama Desert (Arriaza 1995) to contemporary artificial plasticized mummies (Von Hagens, Tiedemann & Kriz 1987). Artificial mummification has been a part of the death and funerary rituals in several cultures at different times (e.g. Aufderheide 2010). Probably the most famous examples are the embalmed Egyptian mummies. The presumably unintentionally preserved bog bodies mainly found in Northwestern Europe (Lynnerup 2010), or the Iceman Ötzi from the Alps (Pernter et al. 2007) are other well-known examples of mummified human remains. The mummies formed utilizing the modern embalming technologies also represent unusual preservation. They are often not considered in connection with the archaeological mummies, although the motivation in creating them may have been very similar. These are such as the remains of Rosalia Lombardo (Piombino-Mascoli et al. 2009), Lenin, or Eva Peron to mention a few (Aufderheide 2010, 161–160, 210–211). Furthermore, not all preserved remains are those of humans. For example, in ancient Egypt, animals were sometimes embalmed, but one of the oldest examples of soft tissue preservation can be found in the remains of a mammoths that lived more than 20,000 years ago (Zimmerman & Tedford 1976).

2.2.1 Mummification in church graves

The spontaneous mummification that took place in the Northern Finnish church graves is believed to result from the cool, well-ventilated conditions. As far back
as in the 19th century, freeze-drying was suggested to have caused the phenomenon (Calamnius 1868, 201). It is likely that especially the remains of those who died during the colder months of the year⁵, when the mean temperatures at the 65th parallel tend not to rise above the freezing point, have gone through mummification (Núñez, Paavola & García-Guixé 2008, 126). However, some similar mummified remains can be found beneath churches in the southern parts of the country, for example in Hauho, Hattula, Mynämäki, and Perniö (Maunula 1974). What is more, ventilation promoted the mummification as the loosely laid plank floors and uninsulated stone foundations of the crypt walls enabled air to move through the closed tombs carrying off the moisture from the surface of the remains, and the building offered shelter from the elements and scavengers. (Kallinen 1990, 126–127; Núñez, Paavola & García-Guixé 2008, 126–127; Aufderheide 2010, 64–65.) Perhaps even the prevailing conditions during the interval period between the death and the burial, which for members of the elite could sometimes be months, may have contributed to mummification. To give an example, Karin Månsdotter, a Finnish-born queen consort of King Eric XIV of Sweden, who was contemporaneous to Vicar Rungius, apparently awaited burial for 2 years after her death. These wakes enabled long-distance relatives and friends to have their final goodbyes, but may sometimes also have caused the corpses to dry out ceasing the normal decomposition process before burial in a church grave. (Kuusisto 1929, 78.) At least in 18th-century Kemi, members of the clergy were especially given wakes, sometimes lasting several months. This custom was probably also the reason for the coffin lids to be equipped with opening mechanisms, although the possibility of later use of such an advantage by the curious parishioners cannot be completely disregarded. (Regnard 1982 [1731], 108; Paavola 1998, 150–152, 155, 162)

Until recently the scientific research aiming to reach a conclusion about the mummification in Finnish churches has been limited. However, since June 2013, the humidity and temperature have been monitored twice daily⁶ in the old churches of Keminmaa and Kempele, and since April 2014, in the church of Haukipudas as well. All these churches are located on the Finnish coast of the Gulf of Bothnia (Fig. 2). The aim is to gather information about the micro-environments of the premises in order to trace the processes affecting the preservation of the remains. To find out how the conditions in the base floors respond to the changes in outside temperature and humidity, the results are compared with the temporally corresponding

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⁵ October to March.

⁶ The observations are recorded daily at 4 A.M and 4 P.M.
observations from the near-by Kemi-Tornio airport and Oulunsalo airport weather stations using the open data source of the Finnish Meteorological Institute. The software application needed to gain access to and to collect the data was created by Lauri Väre, University of Helsinki.

The churches differ from each other. Kempele and Haukipudas churches are wooden and heated during winter. Keminmaa church is made of stone and it has not changed much since the period of church burials, although after the practice formally ended, the crypt has been filled with sand (Núñez, Paavola & García-Guixé 2008, 125). It is essentially possible to reach a conclusion about the original mummification processes based on the measurements taken there. Respectively, the comparison between the sites offers information about the effect of heating in the other churches. Understanding of the mechanisms behind the mummification, but also knowing how it afflicted different tissues, is relevant. As it will later become clear, this information may influence the diagnoses and other conclusions made on the basis of both CT scans and naked eye observations.7

For example, between 16 September 2013, and 15 September 2014, the minimum, maximum and mode values of the temperature and relative humidity in the base floors of the old churches of Keminmaa and Kempele are listed in Table 1. In addition to this, graphs demonstrate the differences between the churches (App. 1) and their measurements in relation to the local weather (App. 2 & 3) during the observation period.

To begin, the temperatures between the locations follow the same approximate pattern throughout the year. However, there is a difference of c. 5.7 °C between the churches, Keminmaa being colder and exhibiting less variation in temperature. The relative humidity patterns are different between the churches. In Keminmaa church, the relative humidity remains very stable. Although the local weather station provided extensive daily variation in measurements, this does not reflect to the underfloor conditions. In Kempele, there is more of such variation, although the church is notably dryer. When compared to outdoor humidity, both churches stay relatively dry, but in comparison with typical insulated and heated indoor conditions they are rather humid. Especially in Keminmaa, the structures of the old church seem to provide excellent insulation, while the changes in the weather conditions reflect much more strongly on the conditions below the Kempele old church.

7 See e.g. pp. 71, 81, 90–91, 94–95.
Table 1. Temperature and humidity (16 Sept 2013 – 15 Sept 2014)

<table>
<thead>
<tr>
<th></th>
<th>MIN</th>
<th>MAX</th>
<th>Mean</th>
<th>Mode</th>
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<tbody>
<tr>
<td><strong>Temperature °C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church Keminmaa</td>
<td>– 9</td>
<td>16.1</td>
<td>5.0</td>
<td>12.4</td>
</tr>
<tr>
<td>Kemi-Tornio airport</td>
<td>– 24.8</td>
<td>28.8</td>
<td>4.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Church Kempele</td>
<td>– 8.3</td>
<td>23.4</td>
<td>10.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Oulunsalo airport</td>
<td>– 25.1</td>
<td>28.5</td>
<td>4.8</td>
<td>0.1</td>
</tr>
</tbody>
</table>

| **Humidity %rH**   |     |     |      |      |
| Church Keminmaa    | 80.9| 93.1| 91.2 | 92.1 |
| Kemi-Tornio airport| 29.0| 100.0| 82.8 | 100  |
| Church Kempele     | 40.7| 73.3| 59.7 | 65.9 |
| Oulunsalo airport  | 24.0| 100.0| 82.7 | 100  |

Table 2. Mean temperature and humidity during winter and summer

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<tbody>
<tr>
<td><strong>Temperature °C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church Keminmaa</td>
<td>0.7</td>
<td>0.5</td>
<td>0.6</td>
<td>9.2</td>
<td>-9.0</td>
</tr>
<tr>
<td>Church Kempele</td>
<td>5.7</td>
<td>-</td>
<td>5.7</td>
<td>14.2</td>
<td>-8.3</td>
</tr>
</tbody>
</table>

| **Humidity %rH**     |                   |                   |      |      |     |
| Church Keminmaa      | 91.3              | 92.3              | 91.8 | 93.5 | 80.9|
| Church Kempele       | 59.2              | -                 | 59.2 | 71.4 | 40.7|

<table>
<thead>
<tr>
<th></th>
<th>Apr–Sep 2014</th>
<th>Apr–Sep 2015</th>
<th>Mean</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature °C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church Keminmaa</td>
<td>9.2</td>
<td>8.6</td>
<td>8.9</td>
<td>16.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Church Kempele</td>
<td>15.6</td>
<td>-</td>
<td>15.6</td>
<td>23.4</td>
<td>4.8</td>
</tr>
</tbody>
</table>

| **Humidity %rH**     |                   |                   |      |      |     |
| Church Keminmaa      | 91.4              | 92.7              | 91.9 | 94.4 | 87.8|
| Church Kempele       | 72.1              | -                 | 59.2 | 72.1 | 44.2|

As mentioned, the mummification is believed to have taken place during the colder months of the year. Therefore, the mean temperatures and humidity measurements between the beginning of October and the end of March should be looked at more closely (Table 2). The same overall pattern can be seen in these values, as Kempele is again about 5 to 6 degrees warmer and notably dryer. Interestingly, in Kempele, the winter-time mean temperature does not drop below 4°C, which is when the bacterial proliferation would cease (e.g. Laiho 1981, 137). During some periods, however, the temperature falls much lower, even in Kempele.

The clear differences in the conditions between the base floors could partially be attributed to the possible effects of indoor heating at Kempele church during
winter. However, the differences are notable even during the summer when heating is not a factor. Furthermore, it could be argued that, at least during the coldest period, the heating in Kempele does not have a clear effect in the base floor conditions as the temperatures in the two localities, as well as their churches, are very similar (Table 2; App.1; 2; 3). All in all, the base floor in Kempele responds rather rapidly to coldness, while in Keminmaa the response is delayed.

One interpretation of the obtained measurements may be that neither the low humidity nor temperature alone explain the phenomenon, but that sufficient ventilation may rather be the key factor. These preliminary results offer a short introduction to the kind of conditions that have caused mummification, and under which conditions the mummified remains are currently held in Finland. The complete data from a longer examination period will be published on a later date in a separate research article.

2.2.2 Studies of the Northern Finnish Church mummies

The CT scanning in 2011 was not the first time the remains of Vicar Rungius have been studied. In the early 1970s, they were analysed by a professor of forensic medicine at the University of Oulu, Jorma Hirvonen. Unfortunately, no report or notes of his findings are available. However, information concerning the examination was collected and published by Kallinen (1990) on the basis of a telephone interview. Hirvonen, for example, estimated that the mummy weighed about 20–25 kg. His tissue analyses showed that despite being thin and dry, the collagen had mummified almost perfectly, and that preservation of the skin in the mummy’s left hand (Fig. 1) was especially impeccable. (Kallinen 1990, 125.) This is actually somewhat unsurprising as the peripheral regions of the body are usually the first to go through mummification, as in these locations the process begins within days of death (Ajmani 1998, 79, 82; Paavola 1998, 148; Dix & Graham 2000, 14, 41; Prahlow 2010, 175).

In the 1990s, the practice of burying the deceased in church graves in the coastal Northern Ostrobothnia was addressed in a doctoral dissertation (Paavola 1998). At the time, the remaining burials in the church of Haukipudas, as well as in the old churches of Kempele and Keminmaa were inventoried (Joona 1997; Joona et al. 1997; Joona & Ojanlatva 1997a; Joona & Ojanlatva 1997b; Kangasvu and Pöppönen 1997; Marjomaa & Ruokoski 1997; Tikkala 1997a; Tikkala 1997b). The practice was additionally studied on the basis of the archival records in these,
and two other parishes in which either the human remains or the entire church no longer exist (Paavola 1998).

During the inventories, observations concerning elements such as preservation, funerary attires and coffin typologies were examined, and whenever possible, the sex and age of the deceased were also recorded. As the inventory was non-invasive, only the remains in coffins without lids, and with lids open or broken could be inspected. Altogether 91 graves were encountered; 32 burials contained completely or partially mummified human remains, while the condition of the remains in 42 sealed coffins remained unknown. (Joona 1997; Joona et al. 1997; Joona & Ojanlatva 1997a; Kangasvuo & Pöppönen 1997; Marjomaa & Ruonakoski 1997; Paavola 1997, 2; Tikkala 1997a; Tikkala 1997b; Tuovinen 1997.) However, only the coffins above the sand floor, and otherwise within reach could be inventoried. More are almost certainly to be found in underground chamber tombs or dug into the soil, as covering the graves was required (Kuusisto 1929, 74; Paavola 1998, 39). Additionally, the studied churches are not the only ones still to contain graves. For example, the old churches in Tornio, Sodankylä, and Siikajoki still contain an unknown number of human remains.

Besides these studies, the graves underneath old Finnish churches have not received much scientific attention. The reason may be their relative modernity as they mostly date to the 18th century. The base floors of the three churches studied in the 1990s were recently re-inventoried. The main focus was on whether any changes had taken place in the condition of the remains. Similar to the studies conducted earlier, only the previously opened or broken coffins were inspected. Additionally, after the 2011 pilot study proving CT imaging to be a useful method in reconstructing life histories in Northern Finland, in 2013 and 2014 similar studies were conducted on seven infants from Keminmaa and Haukipudas. They were scanned inside their coffins with an updated hardware – a 2 x 128-slice dual-energy CT scanner, Somatom Definition Flash, (Siemens Healthcare, Erlangen, Germany & Syngo.via), and the scans interpreted using OsiriX Imaging Software for clinical use.

The CT scans allowed one to look at any material within the sealed coffins, and to create 3-dimensional digital models without prying the coffins open. However, most imaged coffins had been opened at some point after the burial facilitating the comparison between naked-eye observations and CT scans. These studies further substantiated the applicability of the method in the study Northern Finnish church burials as entities. Computed tomography is, to an extent, capable of replacing some of the more invasive methods in collecting information on the funerary
materials. Rendering the images according to differences in densities allows for a differentiation between several types of materials. This essentially makes reconstruction of the whole burial possible without removing textile layers, which is practical while examining the features below the top layers of clothing, even if the coffin is open. Textiles are rare in archaeological contexts, and thus, the availability of well-preserved church burials advances the study of the early modern textile materials in Northern Finland. The scans may also help to examine the building solutions or aid in the classification of the coffin types. (Lipkin et al. 2015; Väre et al. 2016.)

During the re-inventories, signs of rodent activity in the base floors of the old churches of Kempele and Keminmaa were obvious. The CT images revealed droppings, lairs, and food storages also inside coffins, and even inside the remains. Damage inflicted by animals has been reported before, but a comparison between the prior reports and the new observations indicate that the remains have further deteriorated since the 1990s. (Minutes of the Bishop’s visitations [Sep. 17, 1892], The Collection of the Diocesan Chapter of the Diocese of Oulu Eb: 32, OMA; Paavola 1998, 167.) This, however, is expected as such damage naturally accumulates over time. (Väre et al. 2016).

2.3 Vicar Nikolaus Rungius

2.3.1 Who was Vicar Rungius?

Nikolaus Mattson Rungius served as a vicar in the early 17th-century Kemi parish, once covering a vast area of about 450 x 240 km in Finnish Lapland (Vahtola 1997a, 151–152; Hiekkanen 2014, 508). Although his posthumous fame has spread far and wide, the archival records do not contain very much information about either his life or career. The majority of what is known about him is based on legends presumably formed long after his demise (Kallinen 1990, 127–129, 133). Vicar Rungius was not native to the Kemi region (Fig. 2). Rather, he originated from Southern Finland, as did the majority of priests operating in the north at the time (Hyötyniemi 1953, 37; Vahtola 1997a, 156–157). He was born circa 15608 at

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8 When Rungius actually was born is unknown. The year is estimated as circa 1560 in two articles published online in the National Bibliography of Finland, but there is no explanation on how this was concluded (Vahtola 1997b; Väänänen 2011a). In fact, according to Kallinen (1990, 125), Prof. J. Hirvonen had in 1970s estimated that the remains had belonged to a person in his 50s to 60s. This would make Rungius considerably younger than suggested by his approximate birth year.
his family estate\(^9\), located in Onkijoki, Loimaa, in Southwestern Finland (Fig. 2). Both before and after him, several clergymen or other local potentates belonged to his family. For example, his father, Matthias Ryngen, was a vicar of Marttila parish, and his brother a vicar of Mynämäki\(^{10}\). (Hyötyniemi 1953, 38; Hedman 1969, 90; Väänänen 2011a; Toropainen 2012.) Thus, Rungius choosing a clerical career is perhaps unsurprising.

His career began near Turku, which similar to his father’s and brother’s posts, is located close to his native Loimaa. Presumably by the end of the 16th century, he had accepted the post of chaplain in either Kokkola or Uusikaarlepyy parish located on the west coast of Finland (Fig. 2). Around the turn of the century, his journey continued further north as he became the chaplain of the Kemi parish. There he – now in his forties – married Helena Ruuth, who was a couple of decades younger than he. She was a daughter of Simon Nicolai Ruuth, who at the time was the vicar of the parish. (Borg 1944; Hyötyniemi 1953, 38; Kallinen 1990, 125; Vahtola 1997a, 156; Vahtola 1997b; Väänänen 2011a; Väänänen 2011b.)

Apparently during 1614, the health of his elderly father-in-law began to fail, and Chaplain Rungius took over some of the vicar’s duties. At the end of July 1615, Simon Ruuth was still formally the parish’s vicar, but his tenure must have come to a quite dramatic end in prompt succession. Probably already during the same year, he would have suddenly collapsed and died while preaching. Afterwards the parishioners carried his dead body to the morgue. Soon his substitute, Chaplain Rungius, was officially consecrated as the next vicar of the parish. (Cajanus 1927, 90; Vahtola 1997a, 156; Väänänen 2011a; Väänänen 2011b.) It probably happened in 1615 (e.g. Hedman 1969, 90), although the exact year of his consecration has raised some confusion. For example, Itkonen (1984 [1950], 58) suggests that Rungius became a vicar as late as 1618, but assumedly by 1615 he had signed a salmon tax report to the Crown (Herva 1965, 13).

Some sources describe Vicar Rungius as an exceptional preacher and a deeply religious man (e.g. Fellman 1906, 324; Cajanus 1927, 28; Oikelmus 1984 [1950], 64; Hyötyniemi 1953, 38). It is, however, likely that such perception only developed posthumously once the mumified state of his remains had been registered. In reality, during his life he was probably not particularly charismatic or even well-known for a vicar. (Vahtola 1997a, 156–157; Vahtola 1997b.)

\(^9\) The estate was called Rynkö or Rynkä, which is responsible for the family name Rungius (Hedman 1969, 90). The place is presently known as Aittamäki mansion (Toropainen 2012).

\(^{10}\) Toropainen (2012) has encountered difficulties in including Vicar Rungius into this particular family on the basis of the preserved archival records.
Yet, he may have left a relatively good impression on the locals considering that some priests allegedly even resorted to violence in their endeavour to proselyte the Sámi people in Lapland (Itkonen 1968, 85–86, 91, 97–102; Kallinen 1990, 125). Even a village possibly named after him, Runkauskylä, Tervola (Fig. 2), suggests he had a good reputation (Hyötyniemi 1953, 38). What is more, in 1618 he supported the villagers of Inari by signing a complaint about their unbearably high crown taxation, (Hyötyniemi 1953, 38) albeit, this apparent act of benevolence was rather practical on his part. The vicars commonly collaborated with parishioners in disputes over the crown taxation because a comfortable life in vicarage was dependent on the well-being of the parish people. High crown taxation naturally decreased their ability to pay the vicar’s tithes (Virrankoski 1973, 687).

Vicar Rungius served in Kemi parish at least until 1628 and died sometime during the next year (Oikelmus 1984 [1950], 63; Kallinen 1990, 125; Vahtola 1997a, 157–158). Unfortunately, the date of his death is unknown. Nevertheless, the mummification of his remains would suggest him dying during the colder months. This, however, only slightly narrows the possible date of death due to the subarctic climate of the geographic region in question. In any case, the next vicar of the parish, Johannes Olai Pictorius, was not consecrated before 1630 (Cajanus 1927, 90; Vahtola 1997a, 156).

Although rather little is known about Vicar Rungius, his remains give away some clues about what he may have been like (Fig. 1). He appears to have been a fairly sturdy, and comparatively tall man (see also e.g. Kaiku 1887, 3; Jakobstads Tidning 1900, 3). Oikelmus (1984 [1950], 63) went as far as to associate determination and vigour to his facial features, especially his robust jaw. This characterization may very well not have been too far from the truth. After all, as a vicar of the parish he must have been a highly respected character enjoying the various benefits that came with his rank (Virrankoski 1973, 687).

2.3.2 The remains of Vicar Rungius

Vicar Rungius’s remains are a good example of the natural mummification in the graves found beneath old Finnish churches, although there are other remains that have preserved even better than those of the famous vicar. Climate-wise, the early 17th century may have been especially favourable for cold-induced mummification as there was a quite drastic drop in the mean temperatures at the time (Vahtola 1997a, 119). During the centuries the fate of Vicar Rungius’s remains has, however, been explained in various other ways too. Some have suspected embalming, but it
would fit poorly with the Finnish burial customs. Also a group of British scientists examining\textsuperscript{11} the mummy had concluded that such was unlikely (Kaiku 1887, 3; Oikelmus 1984 [1950], 63). In the 1880s, the high salinity of the soil was suggested as a reason, and in 1930s the cause was believed to be ground radiation (Kallinen 1990, 126).

Mummification of the remains must have been obvious to the parishioners by the early 18th century, at latest. In October 1704, a new coffin was bought for Vicar Rungius’s remains to replace the old rotten one (The Church’s income and expenditure accounts 1700–1716 [Oct. 9, 1704] IIITI:2, General ledger, Archives of Kemi parish, OMA). This was probably the first time the coffin was renewed, although certainly not the last as they kept rotting away around the remains that seem to be beyond the touch of time. (Borg 1944; Cajanus 1927, 29; Itkonen 1976, 20; Knihtilä 1982).

At least one 1820s eyewitness report mentions him lying in a badly broken coffin (Fellman 1906, 324; Itkonen 1976, 14; Paavola 2009, 246). Such a state probably led to purchasing yet another coffin, and by 1900 he was already in his third one (Jakobstads Tidning 1900, 3). According to Kallinen (1990, 129), by 1935 the remains would have been placed into their present glass-lid coffin and put in their current location (Fig. 1). Furthermore, in a newspaper article from 1948, Vicar Rungius was mentioned to be resting in this glass-lid coffin (Haapakoski 1948). Nevertheless, according to an article published in 1950, the mummy had lain in a black coffin, and could only be seen once the guide had removed a couple of floor boards and opened the coffin lid (Oikelmus 1984 [1950], 63). Perhaps this latter article described a much earlier occurrence. Despite the inconsistencies in these stories\textsuperscript{12}, if these deductions are correct, Vicar Rungius is already using at least his fourth coffin (see also Knihtilä 1982). Borg (1944), however, believed that by the 1940s, he had already “outlived” as many as five coffins.

In the 18th century, the parish began to exhibit the Vicar’s preserved body. It eventually became a popular tourist attraction – perhaps even an unofficial relic comparable to the incorruptibles of the Catholic Church, despite the Reformation centuries earlier. Before the 19th century, the exhibition must have remained a small-scale activity mostly targeted to locals, as no foreign authors, who were

\textsuperscript{11} According to the story, these British scientists had cut of a part of the mummy’s toe and tasted the flesh to find out whether it was embalmed or not. Apparently, the taste had resembled rotten wood. (Kaiku 1887, 3.)

\textsuperscript{12} According to Haapakoski (1948), both arms of the Vicar have broken off, which is false. His left arm is intact.
otherwise describing the Kemi region, mention either Vicar Rungius or his remains. (Huurre 1983; Kallinen 1990, 129, 132–133.)

The mummy has also functioned as a source of revenue. Right up into the 1980s, the parish was collecting fees from visitors, and the income was used to provide maintenance and a summertime guide for the church. (Knihtilä 1982; Kallinen 1990, 130–131.) In this regard, Vicar Rungius was still participating in taking care of his home church. Moreover, it is worth remembering that in the past, even paid tours in crypts full of graves were not uncommon (Olsson 1956, 18-19; Paavola 1998, 146–147). Nowadays, collecting such fees would perhaps not seem completely appropriate, and visiting the mummy of Vicar Rungius under the supervision of the parish representatives is currently free of charge.

After 1704, the next time the late vicar appears in the parish archives is in a 1728 document listing the graves under the church. According to this document, his original gravesite was in the southeast corner of the church. This is a quite expected location for his grave as the area below the chancel was typically reserved for the clergy burials. (List of graves 1728–1728 IAI:1, Documents concerning the churchyard and chapel, Archives of Kemi parish, OMA; Cajanus 1927, 29.)

A 1747 document listing priests brings up the perfect preservation of the remains of Vicar Rungius (Vahtola 1997a, 156). Nevertheless, only slightly more than hundred years later, the condition of the remains was no longer pristine. A release published in 186813 points out the right forearm of the mummy to be missing (Calamnius 1868, 201), which is naturally the case also today (Fig. 1). Peculiarly, a later source claims that still almost a decade later – in 1875 – both arms had been crossed on the mummy’s chest (Cajanus 1927, 28). The current location of this unfortunate forearm, as well as the exact date it was lost, are unknown although the possible time span could rather safely be narrowed to the period between 1747 and 1868 (Calamnius 1868, 201; Vahtola 1997a, 156). The story of this forearm is also well covered in the local folklore, which will be addressed in the next subchapter.

The damaged state of the remains was again addressed in an 1892 Bishop’s report. He brings into attention that the remains have been harmed by rodent activity, but also by incautious handling, and he orders the coffin to be locked. Prior to this, the unguarded remains were openly exhibited and could be accessed in their original burial site by anyone so inclined. Only after the bishop’s orders, the parish representatives took control over the access to them. (Minutes of the Bishop’s

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13 According to Calamnius (1868, 191), some of his recollections date back as early as 1862.

Most sources assume that the remains exhibited in the old church of Kemimmelaa once belonged to whom they are supposed to have belonged. For example, Cajanus (1927, 28–29) considers the two different old documents (in 1728 and 1747) mentioning the preserved body of Vicar Rungius to confirm this. However, as several other human remains have mummified in the church over the centuries, this may not be completely convincing evidence. Thus, the issue will be further pondered upon later in this thesis.

2.3.3 Vicar Rungius in folklore

Vicar Rungius is a well-known figure in Kemi folklore. Most of the legends concerning him deal with his disappeared right forearm, or explain the mummification of his remains. Although the locals have essentially been aware of the mummification since the early 18th century, for the major part, the legends have formed during the 19th century (Kallinen 1990, 129, 133). This is when the Vicar’s fellow men of the cloth began writing down various, mostly religiously inclined stories concerning him (e.g. Calamniius 1868, 201–202; Fellman 1906, 324; Cajanus 1927, 28; Itkonen 1976, 14–16). During the following century, the fate of his remains was a topic of discussion in the national press. In the 1940s the mummy was even used in war propaganda. Particularly in the 1970s and 1980s, the whole tradition of keeping the remains on exhibition raised ethical and religious concerns. By then, the local folklore had also become available to broader audiences. (Borg 1944; Maunula 1974; Knihtilä 1982; Huurre 1983; Kallinen 1990, 130–133)

The forearm most likely went missing after it broke off by accident as mummified tissues are generally relatively frail. Another quite believable explanation is that it was taken as a personal souvenir by an anonymous American visitor (Kallinen 1990, 128; Vahtola 1997b). In addition, more legendary alternative explanations have been suggested in the local lore; either the mummy was vandalised by a lazy sexton (Calamniius 1868, 201–202; Castrén 1894, 58; Kallinen 1990, 128), or manhandled by intoxicated trespassing men dancing with it (Oikelmus 1984 [1950], 64–65; Itkonen 1976, 16; Kallinen 1990, 128). Moreover, other stories tell about disrespectful demeanour towards the mummy. According to one of them, men were playing cards in the dusky church. As they placed a burning splint between the jaws of the mummified Vicar for light, the mouth would have suddenly opened scaring the men thoroughly (Borg 1944). However, rather than
actually portraying true events, the moral behind the story is the importance of respectable behaviour towards the dead (Kallinen 1990, 128).

The most famous legend – again told in several slightly differing versions – explains the remarkable preservation of Vicar Rungius’s remains. Basically, he had once preached that after his death, his remains would not decay or turn into dust and ashes if his sermons were true. (Fellman 1906, 324; Cajanus 1927, 28; Oikelmus 1984 [1950], 64; Vahtola 1997b.) The “miracle” of his preserved body combined with the declaration of heavenly involvement, indeed, resemble the incorrupt saints of the Catholic Church (Kallinen 1990, 132; see e.g. Piombino-Mascali et al. 2010, 357). The story, nevertheless, may have formed as late as the 1800s to boost the Lutheran doctrine (Kallinen 1990, 129, 133) – centuries into the Reformation. Some stories even emphasize that his body will not decay if the new doctrine – referring to the Lutheran faith – is true (Jakobstads Tidning 1900, 3; Cajanus 1927, 28; Oikelmus 1984 [1950], 64). This is despite the fact that by the Vicar Rungius’s tenure, Lutheranism was hardly a novelty (Itkonen 1976, 15; Kallinen 1990, 127).

In the version told by Fellman (1906, 324), Vicar Rungius had gathered his parishioners in the church during a drought and lifted his arms preaching the following:

*As surely as this arm, and my whole body will not turn into dust and ashes after my death, but will remain whole until the Judgement Day, will God have mercy upon us, and moisten the earth before sunset, if your prayers are sincere, and you join me in prayer*14

According to the legend, it rained exceptionally hard during the same evening.

The mummy continues to be an important destination for tourists visiting the Kemi area. After such a long co-existence the mummy is a natural part of the local identity, and as seen, an important source of tradition. Part of the appeal of Vicar Rungius’s preserved remains is undoubtedly religious, and in its own way his dead body still spreads the Gospel (Cajanus 1927, 28). It represents an incentive strengthening the faith while functioning as a practical proof of its power over death. This is further substantiated by the legends explaining the mumification. To modern viewers, who perhaps have lost touch with their own mortality, the remains are a reminder of the limitedness of the earthly existence. These religious implications that the

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14 “Så sannt denna arm och hela min kropp efter min död icke skall förvandlas till stoft och aska, utan förbliva hel till domedagen, förbarmar sig vår Herre öfver oss och fuktar jorden före solens nedgång, om edra böner äro allvarliga och i förenen dem med mina”.
remains hold certainly advocated for their continued exhibition when the practice was questioned in the late 20th century. (Knihtilä 1982; Kallinen 1990, 130–133)

2.4 Living and dying in Early Modern Kemi parish

The early 17th-century Kemi was a rather sparsely populated parish. Nevertheless, during the late 16th century, particularly in the heartlands, population growth and the settling of new farms was rapid. While in 1595, the number of households had been 153, which is an equivalent of approx. 1,100 inhabitants, at the turn of the century their number had increased to 198 and in 1633, a few years after the death of Vicar Rungius, there were 340 households. (Hedman 1969, 50; Virrankoski 1973, 15, 25)

Well beyond the 17th century, most dwellings likely were small cottages without chimneys, which were common also elsewhere in rural Finland. For example, in the near-by village of Kaakamo, located c. 5 km from the old church of Keminmaa, the more modern buildings with chimneys generally replaced the old-fashioned housing stock as late as the 19th century. (Hyötyniemi 1987, 49; Salo 2016, 24; Vuorinen 2002, 68.) The air inside these chimneyless cottages of 17th-century Kaakamo was filled with smoke, and the small windows made of calf skin would not provide much light. Especially in winter, space was scarce, given that typically parents with 4 to 8 children – and often at least a cow, dwelled in the same quarters. In crowded rooms, many diseases also spread easily. (Hyötyniemi 1987, 49–51).

Although the smoke may have been beneficial in the fight against the dense mosquito population of Kaakamo (Hyötyniemi 1987, 5), inhaling smoky air particularly affects the health of the respiratory system (Vuorinen 2002, 68; Salo 2016, 24). Naturally, also living in close contact with the domestic animals may predispose people to their bacterial flora (Vuorinen 2002, 42). This, however, also had its advantages. For example, the milkmaids were often spared from small pox as they had previously contracted a related bovine disease capable of transmitting humans, cowpox (vaccinia). From the late 18th century, this realization led to development of effective vaccination against the small pox (Vuorinen 2002, 127, 133).

In Kemi, the market fairs also brought colour to everyday living. Especially in summer, the sea functioned as an important route of import and export bringing people and commercial goods to the region. Fairs gathering up masses of people from near and far were organized during midsummer and at the turn of the year,
but in practice, the merchants typically stayed on site for much longer periods of time. At least since the mid-16th century, the market fairs were organized on an island, Haminasaari. It was located in front of the old church of Keminmaa in the middle of the River Kemi. In the early 17th century, most merchants came from the nearby towns of Oulu and Tornio, but some travelled from as far as the Southern Sweden. Although the trade practiced by the Karelians had been banned in the area as early as the mid-16th century, they were not an unfamiliar sight, either, and they often arrived via the River Kemi. Haminasaari maintained its function as a market place until 1821, when it burned down. Today the island no longer exists. In 1948 it was drowned by the masses of water after the Isohaara hydroelectric power plant was built closer to the mouth of the river. (Hedman 1969, 159–165; Virrankoski 1973, 161, 164, 166)

In the 18th and 19th centuries, but probably before as well, the Kemi market fairs – where alcohol played an important role – lured characters such as beggars and prostitutes to practice their trade among the gentry and commoners. This combination often resulted in variety of disorderly behaviour. The crowds gathering up also offered an opportunity for diseases to spread, as it is likely that the level of hygiene was less than optimal. Even the alcohol abuse escalating during the fairs may have had an effect on the public health. (Hedman 1969, 166–167; Salo 2016, 24, See also Mäntylä 1971, 204–205.)

2.4.1 Subsistence economy in Northern Finland

Analyses of archaeological food-remains from garbage heaps of early modern Northern Finnish towns on the coast of the Gulf of Bothnia, as well as the written sources addressing the topic, indicate that the local contemporaneous diet was mainly based on protein-containing foodstuffs. They were such as mainly fish and dairy products, but also meat acquired by fishing, hunting, and animal husbandry (e.g. Salmi 2011, 232; Luukko 1954; 381–479; Virrankoski 1973, 179–348; Vilkama, Kylli & Salmi 2016). Still in the 17th century, year-around subsistence had to be pieced together from multiple sources utilizing the rich natural resources in as versatile a way as possible. Everyday living was physically demanding. (Luukko 1954, 380–381; Virrankoski 1973, 270; Vahtola 1997a, 119.)

Particularly along the River Kemi, but to an extent the other rivers running through the coastal communities of Northern Ostrobothnia as well, the economy has traditionally been based on the abundance of salmon. Quite early on, the annual salmon run during mid-summer attracted a permanent habitation of considerable
size to the Kemi region. (Regnard 1982 [1731], 104; Vilkuna 1951, 8–11; Cleve 1955, 3; Luukko 1954, 354, 417, 422; Hedman 1969, 107; Vilkuna 1974, 7; Vahtola 1997c, 73; Vahtola 1997a, 120–125.) For example, by the end of the 17th century the river yielded annually nearly 350,000 kg of salmon, and already in the previous century catches of 150,000 kg per year had well been possible (Vahtola 1997a, 121). Fishing in general was an important cornerstone of economy; men travelled to catch pike in the remote lakes of Lapland, and the rich marine resources were utilized (Regnard 1982 [1731], 28, 102–104, 107; Luukko 1954, 399, 409, 433–437; Virrankoski 1973, 270, 286–288, 346, 348; Vahtola 1997a, 120, 125–127; Salmi 2011, 227). In addition to fishing, seals and the migratory waterfowls were hunted, and even the eggs of the latter were collected (Luukko 1954, 398–399, 417, 437–441; Virrankoski 1973, 276–278).

From the late summer until early spring, the livelihood was supplemented with the meat of deer and moose. Species such as squirrel, beaver, wolf, weasel, or bear were not necessarily used for nutrition, but mainly killed for their fur, which was then sold, used to pay taxes, or exchanged for goods that could not be produced at home. (Regnard 1982 [1731], 24, 28–29; Luukko 1954, 381, 396, 398; Virrankoski 1973, 270, 276; Vahtola 1997a, 127; Salmi 2011, 226–228.)

During the 16th century, the significance of cultivation in the Kemi region was still marginal. Although by the next century the cultivated area had grown, the true increase only took place after Vicar Rungius’s time. The isostatic rebound in the region had given rise to plenty of meadowlands suitable for cultivation, but the local fields were also easily frostbitten and their crops prone to be whisked away by spring floods. Both field cultivation and slash-and-burn techniques were, nevertheless, applied. (Vahtola 1997a, 129–130.) Some rye, but mainly the less cold-sensitive barley, were cultivated, although not always enough to obtain self-sufficiency. Household production of barley was mainly used in brewing and covered the domestic consumption of beer. Vegetables were also grown, the most important product being swede. In order to obtain supplementary crops, the surplus production of fish, butter and fur, but also such things as cloudberrys were exchanged at the market place. Furthermore, products such as bread, wine, spirits, beer and especially salt used in preserving fish and meat, were brought from the south. (Hedman 1969, 166; Virrankoski 1973, 195–196, 386; Regnard 1982 [1731], 16, 22, 104, 107; Mäntylä 1971, 53; Vahtola 1997a, 133–134.)

For one, the lack of manpower was accountable for the poor investment in risky, labour-consuming crop cultivation. During the growing season, men were either fishing or hunting as these activities had traditionally ensured the basis of the
subsistence economy. The productivity of agriculture was also poor due to the insufficiency of the available technology. (Luukko 1954, 445, 454; Hedman 1969, 130, 133; Virrankoski 1973, 197, 347; Regnard 1982 [1731], 28, 107; Clarke 1997 [1799], 171, 202; Vahtola 1997a, 129; Helistö 2001, 230.) Moreover, the beginning of the 17th century was a climatically unfavourable period plagued with long harsh winters and short, cold and rainy summers. Consequently, several crop failures had a serious effect on the local economy, which even further emphasized the significance of natural resources, but also of trade activities. (Virrankoski 1973, 16, 207, 317; Vahtola 1997a, 119, 130–131)

Instead of cultivation, the meadows – although often lacking in hay – were exploited in animal husbandry, which was typically managed by women. The livestock was imperative for the region’s subsistence, although the sufficiency of animal feed was a frequent problem. (Vahtola 1997a, 128.) In particular, cattle, but also chicken, sheep, and pigs were kept for eggs, wool and meat, respectively. Milk could not be preserved, but other dairy products, particularly butter, were important. Even reindeer was not uncommon in Kemi. Like horses, they were used as draught animals, but their meat was undoubtedly also consumed, while the horse meat was typically not. (Regnard 1982 [1731], 48–51; Luukko 1954, 464, 472; Hedman 1969, 138; Talve 1973, 42–43; Virrankoski 1973, 241–244; Vahtola 1997a, 128–129; Bläuer 2015, 54.)

Overall, in the early 17th century, dishes in Northern Finland made of animal products, be it of fish, game or livestock, were very common. On the other hand, the intake of carbohydrates must have been comparatively low, even though carbohydrate-containing berries and honey, as well as beer, porridges and bread were all consumed (Regnard 1982 [1731], 22, 111–112; Magnus 1976, 286–300; Talve 1961, 72; Talve 1973, 15, 72, 77, 82–83, 96). Sugary food items were rather uncommon even among the elite (Mäntylä 1971, 511; Mintz 1993, 264). For example, virtually nothing of the sort was present in an early 17th-century document listing the food products reserved for a visitation by the King of Sweden in the near-by town of Oulu (Virkkunen 1919, 374–375; Tranberg 2011, 241; Vilkama, Kylli & Salmi 2016; Fig. 2). By the following century, however, a considerable change had occurred in the availability of sugar. Although still expensive (Clarke 1997 [1799], 204, 346), it was at the time used to season the dishes of the gentry, even in the north of the country (Mäntylä 1971, 511; Outhier 1975 [1744], 116).

Vicars were usually by far the richest persons in the Northern Finnish parishes. In the virtual absence of the nobility in the countryside parishes, this gap between
the vicar and his parishioners was typically emphasized. Although basically dependent on the parishioners’ income, unlike them, vicars were not forced to spend most their time performing physically demanding labour in making their daily living. What is more, they were presumably able to consume ampler and more versatile diets in comparison to the commoners at the time. (Virrankoski 1973, 682–683; Regnard 1982 [1731], 104.) Distinguished dietary choices may have also served the need to differentiate between the social classes, and thus, what was eaten may have been dictated by the social order (Counihan 1999, 7–9; Scholliers 2001, 3–4).

The main benefit of the vicar’s post was the vicarage with its livestock and fields. The farm was free of taxation and typically the largest in the parish. Its production was complemented with tithes paid by the parishioners from their domestic production. On top of that, the vicar could charge for work assignments, and the parishioners donated presents to ensure his, and thus, the God’s favour. Frequently, all that was received could not be used in the vicarage, and the surplus was commonly traded off, and the earnings used to buy, for instance, private farms. As an example, the successor of Vicar Rungius owned 3 private farms in the region. Altogether the annual revenue of the vicar’s post could exceed the total value of the next wealthy parishioner’s possessions. The early modern Northern Finnish vicars were essentially the leading local businessmen of their time. (Virrankoski 1973, 679–683, 685–687)

The chaplains’ standing was a little different as they were basically personal servants of the vicar, and usually much less well-off (Virrankoski 1973, 678, 684). In 1610, while still a chaplain, Rungius and his wife had, however, made an unusually large donation to Kemi parish (Vahtola 1997a, 156). This indicates that locally the position of chaplains may not have been all that bad (see also Virrankoski 1973, 687) – unless Chaplain Rungius’s economic situation was merely due to his, and particularly his wife’s, influential relations.

### 2.4.2 Diseases and death in Kemi parish in 1698–1797

In order better to understand the lifespan and deadly diseases in the early modern Kemi parish, the deaths recorded in parish registers during the hundred-year period between 1698 and 1797 were examined. This period was selected as no data closer to Vicar Rungius’s lifetime exists. The death dates and the ages of the deceased were recorded since 1698, and the causes of death appear in registers after the 1749 legislative amendment obligated them to be listed by the parish officials in the
Swedish kingdom (e.g. Vuorinen 2002, 255–256). In Kemi, the registration system only changed in 1751.

These registers are found online in a digitalized database (HisKi project 2016). It was primarily created to aid genealogists searching for information, and the service is not intended to replace the use of the original records, or their copies in research. Nevertheless, it does provide a useful tool in the study of the history of diseases, as long as its limitations are understood. Unfortunately, the database is not complete and may contain mistakes. The data has been collected from the actual hand-written death registers that are sometimes difficult to interpret, and has not been double-checked. Despite its flaws, the database has been successfully applied to Finnish palaeopathological research in the past (see e.g. Salo 2016). In this study, its use may be justified by the fact that it merely functions as a reference to enable an examination of the results concerning Vicar Rungius in the right context. It does not form the actual study material15.

Furthermore, in terms of modern medicine, the diagnoses listed in the death registers are imprecise and cannot always be considered reliable – which was already recognized when they were first created. Instead of medical professionals, the causes of death were usually determined and recorded by a priest, who did, however, often have some medical knowledge. Even the doctors were often unable to distinguish, for instance, between the different poxes. Moreover, the names under which each disease or cause of death was recorded were also multiple. Their classification was based on different understanding of etiological factors and they are often not comparable with the modern diagnoses. Prior to the bacteriological revolution of the 19th century, medicine was based on the doctrine originating from ancient Greece, according to which diseases were caused by an imbalance in the complexion of the four humors – blood, phlegm, yellow bile and black bile – and the same diseases (dyscracias) could cause a variety of different symptoms. (e.g. Vuorinen 2002, 24–26, 317–322; See also Olai 2008 [1578]). Moreover, the registers do not contain the various ailments from which the people in the parish may have suffered. Naturally, those diseases that did not actually lead to death are not found in the registers, even if their effect was serious.

Despite the many limitations of the data and the comparatively late date of the archival records, they can facilitate the study of health in pre-antibiotic, pre-vaccination Lapland. During Early Modernity, there probably were no actual

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15 This is also the reason its disadvantages are discussed here instead of in subchapter 4.4. Limitations of the study.
medical doctors in the area (Regnard 1982 [1731], 28; Vuorinen 2010, 191). The sources describing the local healthcare practices at the time are almost non-existent, but it is likely that the people were mostly responsible for taking care of their own health, and relied on various traditional healing methods, such as the sauna, witchcraft, bloodletting or cupping – and alcohol. Many of these are currently considered enchorial methods, but at the time, some of them were also used by the academically trained medical doctors. Barbers and bath-keepers, who were experts in wound treatment and battlefield medical techniques, were usually found in larger towns. The medieval towns of Turku and Viaborg already had connections to European centres through which the new improved practices in caring for the sick diffused. However, these novelties hardly concerned the north of the country for several centuries to come. (e.g. Hyötyniemi 1987, 51–52; Vauhkonen 1992, 191–192, 195, 199; Sarmela 1994, 127; Vuorinen 2002, 24; Tittonen 2007; 2008, 52; Vuorinen 2010, 191, 195.)

The data utilized in this study consists of digitalized copies of the registers of the deaths of 3,903 individuals (1,956 males, 1,947 females, and 111 of unknown sex) (HisKi project 2016). The sex was usually not separately indicated in the records, but can be deduced by the name of the deceased. Hence, if the name was missing, also the sex remains a mystery. However, nearly all for whom the sex could not be determined were small children – usually infants, with the exception of one teenager and two adults.

The overall meticulousness of the Kemi parish death records – at least in the database – vary between decades (HisKi project 2016). For instance, whenever the date of death was absent, the burial date was used in the analyses instead, regardless of the fact that the interval between the two may sometimes have been rather extensive (see e.g. Regnard 1982 [1731], 108; Kuusisto 1929, 78; Paavola 1998, 155, 262). In 1716–1717, there were no entries. One explanation – rather than the lack of deaths – may be the disarray of the Great Northern War (1714–1721). Finally, although typically marked within a day’s accuracy, the age at death was sometimes missing. This mostly concerned neonates indicated by first name and attributed as a “son” or a “döter”. However, some individuals lacking age information were indicated with titles such as widow (enkaänka), or wife (husfru, 16 Daughter.}
h:u)\textsuperscript{17}, which meant that they had to be excluded from the analyses concerning the age.

Eventually, the age at death was available for 3,887 individuals. The majority had died in their childhood. No fewer than 1,569 individuals\textsuperscript{18} had died before their first birthday, which represents a whopping 40.4\% of the overall mortality of the period. An added amount of 245 infants (6.3\%) died before the age of two. (Fig. 3) The massive infant mortality experienced in 18th-century Kemi rather drastically lowers the average age at death, which is 19.3 years for males (N = 1,949; MD = 2 yrs.), and 25.4 years for females (N = 1,937; MD = 6 yrs.). There is also a significant difference in the age-at-death between the sexes (two-tailed T-test, \( p = 0.000; \text{SD} 25.4 \)). For comparison, in 2014, the life time expectancy for Finnish newborn boys was 78.2 years and for girls 83.9 years, and the median age at death 75.5, and 85.0 years, respectively (OSF 2015A).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{deaths_by_age_group}
\caption{The child mortality rate was high in the early modern Kemi parish.}
\end{figure}

\textsuperscript{17} Sometimes, other more colourful attributes suggesting social standing such as “a young female person from the south” (en ung qvinsper. Soder r.f.) were used.

\textsuperscript{18} The figure includes stillborn babies in 1698–1797 (88 individuals).
The child mortality rate in the early modern Kemi parish was high enough to make the obtained averages rather uninformative, even misleading, in consideration of the typical lifespan of adults. A slightly more realistic picture may be provided by focusing the analyses on those individuals who survived through the dangerous years of infancy overshadowed by various infectious diseases. For example, for males (N = 680) who lived past their 16th birthday, the mean age was 51.9 years, and median 52 years, while for females (N = 867) the same figures were 54.7, and 57 years, respectively. Even the elderly people were not completely absent in the material. About 8.6% of males and 12.2% of females had lived to their 70s or beyond, thus presumably dying older than Vicar Rungius. Some had even passed the milestone of 100 years. Interestingly, the difference between the sexes was still statistically significant (two-tailed T-test, p = 0.009; SD 21.0).

Between 1698 and 1797, the cause of death was registered for 2,251 individuals. Prior to 1751, this information was only sporadically recorded by and large if the deceased was a stillborn baby (N = 27), and if the deaths were related to accidents (19) or violence (12). Thus, in this study, only those cases after 1751 were considered.

The utilized material consists of 2,192 cases. However, the problems in the source material soon crystallized. To begin with, for 748 individuals, who were mostly children, an “unknown disease” or “unknown children’s disease” (okända sjukdom, okända barns sjukdom) was reported as the cause of death. Additionally, stillborn babies were well represented with 61 cases. At the opposite end of the spectrum, simply old age and frailty (älderdom, af ålder, älderdom &] bräcklighet) were recorded as the cause of death for 226 individuals. It is questionable whether mere age can cause death, and in a modern-day perspective, it certainly is not a reasonable explanation for those who had died in their 60s, or even 50s.

Once the most problematic cases are excluded, at least a remotely diagnostically informative cause of death was recorded for 1,157 individuals19. Yet, there are still quite of few categories that remain perplexing in terms of present day diagnostics. Various terms described sudden deaths (N = 67), which could obviously have resulted from several different reasons, among them strokes, infarcts, and miscellaneous lung and heart conditions (brådöd, [bråddöt], hastig, stickfluss, stichfluss, slag). This category also includes the more mysterious terms such as “i skott”, “af skått” or “skottsjuka”. According to the dictionary of the

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19 The causes of death were interpreted using Vuorinen’s (2002, 317–322) and Forsius’s (2013) descriptions.
Academy of Sweden, these were used to describe sudden deaths believed to be caused by witchcraft (SAOB 2014; See also Sarmela 1994, 126–127). However, in present-day Swedish “skott” may mean a gunshot, or even cancer. Moreover, many rather vague symptoms, such as chest pain (bröstvärk; N = 42), were nominated as contributors of mortality.

In the 18th-century Kemi parish, the most common cause of death that is recognizable today was variola (koppor, 253). However, even these diagnoses may be of suspect quality due to the incapability of the doctors to recognize the various poxes with certainty (Vuorinen 2002, 26). Furthermore, the otherwise undefined severe fever (bränd sjuka, hitsig/hetsig feber/sjukdom, feber; 129), whooping cough (kikhosta; 94), gastric problems (rötsot, bukref, ref, utsot, colique, diarrhë, durchlop, förstoppning, magref, magsjuka; 93), and influenza (flussfeber, can also mean another respiratory infection; 91) were rather usual, although the aforementioned diagnostic problems still apply.

Variola, as well as whooping cough, are clearly children’s diseases. From 1751 until the end of the examination period in 1797, six major variola epidemics with intervals of 5 to 8 years hit the Kemi parish. In a small community, such as Kemi, it probably arrived with the merchants, beggars and other vagabonds who apparently were a familiar sight at the local market fairs. Consequently, it infected the new generation of unimmunized children born after the previous epidemic. For those surviving, the infection usually offered a lifetime immunity, but often also badly scarred skin, and sometimes blindness, deafness or kidney failures. Up to a third, however, died. The disease inflicted considerable mortality prior to the successful vaccination campaigns. Savonen (1931, 8) recounts that in 1763, more than 11,000 of every million inhabitants died of variola in Finland, which he reports to be almost a corresponding figure to the total mortality in the country in the early 20th century – 14,000 per million.

Various gastric dysfunctions also caused considerable mortality. Due to the discrepancies in the modern diagnostics and the diseases recognized in the 18th century, there is again a brigade of conditions hidden under this category, perhaps varying from food poisonings to germs and parasites, or even inedible food and poor nutrition. For instance, dysentery (rötsot, 48) can be caused by several different organisms. (Vuorinen 2002, 318, 321.)
In Kemi parish, gastric cases increased slightly in the spring when food was scarce after a long winter. However, death by starvation has only been recorded in two cases, of which neither took place during the observation period (1751–1797). Both date to March, 1698, and involve pre-teenage boys. These deaths are probably connected to a famine that during the previous years had swept through the Baltic Sea region. Throughout the 17th century, the unfavourable climatic conditions caused several failures of crop, and finally led to what is known as the Great Famine (1695–1697), which had badly affected the Kemi region (Vahtola 1997a, 131) as well.

The causes of death differed between age groups. When examining elderly individuals alone (60–79 years; 130 men, 183 women, 1 unknown sex22) who were the most comparable with Vicar Rungius in terms of age, the picture of the most common diseases leading to death was different. After 149 individuals who were reported to have died of mere old age and weakness were excluded; the elderly in late 18th-century Kemi parish were most commonly killed by styng or chest fever (N = 22), severe fever (21), influenza (20), chest pain (18) and tuberculosis (TB) (17).

The TB deaths in mid-18th-century Kemi are especially interesting as indications of the disease’s presence were encountered in the remains of Vicar Rungius. TB cases were recorded using several different, yet, to a modern reader, ambiguous terms23. Assuming that lung disease, chest disease, consuming sickness, wilt disease, blood coughing, blood plunging, running of blood, and blood flow all described TB deaths, 54 cases were reported between 1751 and 1797. Furthermore, a rather peculiar cause of death listed as sting (styng, håll), refers to a stinging in chest caused by conditions such as pneumonia or pleuritis. Once lumped together with chest fever, which is related to similar conditions, the two amount to 70 cases. Although these deaths must have resulted from various other diseases, TB is one good candidate. Accepting all the cases as TB deaths would raise the count to 124, which undoubtedly is a rather optimistic approximation.

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22 In terms of the most common causes of death, the sexes were not considered separately due to the small sample size.
23 Quite unambiguous lung disease (lungsot) or chest disease (bröstsjuka), as well as causes indicating withering, such as consuming sickness, or wilt disease (tärande sjukdom, tvinsot, trånsjuka) were used. Moreover, cases of blood coughing (blodhostning) and those describing haemorrhaging, such as blood plunging (blodstörning), running of blood (blodgång), or blood flow (blodflöde) can be interpreted as TB although e.g. lung cancer may cause similar symptoms and for instance blodflöde may also mean other bleeding. (e.g. Backman & Savonen 1934, 10; Vuorinen 2002, 317–322; Forsius 2013.)
There were no clear differences in the amount of TB deaths (54 cases) between the decades, nor did any season or either sex stand out in the material. The older individuals did, however, succumb to the disease more often, and the average age of those who died of it was considerably higher than that of the others found in the material (mean of 45 vs. 22.4 yrs.). It had seldom killed the young under 20 years of age.

Most terms used to describe TB in the parish death records seem to point towards the pulmonary form, although once the bacilli \textit{(Mycobacterium tuberculosis complex, MTBC)} enter the bloodstream, infection may occur in practically any tissue. Extra-pulmonary infections emerge in about a fifth of cases while concurrent lung involvement is not necessary. (Aufderheide & Rodriguez-Martín 2011, 121; CDC 2014, 74–75; Herath & Lewis 2014.) A massive haemoptysis sometimes seen in the final stages, as well as the general clinical picture of the disease were probably familiar (e.g. Olai 2008 [1578], 63–64; 68), while some rarer forms may not even have been recognized at the time. On the other hand, false diagnoses were surely also made as typically any death involving severe coughing was recorded as TB. (Vuorinen 2002, 176–177; Roberts & Manchester 2010, 183.)

The disease can also stay latent for long periods of time, and will not necessarily kill the patient. Currently, in merely 10 % of those infected will it develop beyond this initial stage, but in the absence of effective therapies, active pulmonary TB is still ultimately lethal in a third to more than half of cases (Aufderheide & Rodriguez-Martín 2011, 119; CDC 2014, 74–75; WHO 2015). The speed in which it leads to more severe symptoms or death is dependent on the strength of the patient’s immune system. However, in the past, when several acute, and at the time untreatable, infections posed a health threat, often another disease claimed the life before the chronic TB had run its’ course (Larsen 1999, 64; Roberts & Manchester 2010, 13–14; Aufderheide & Rodriguez-Martín 2011, 117–120). Thus, even the active disease, let alone the latent primary infection, may actually have been considerably more common than the death records would suggest (See e.g. Savonen 1937, 5, 48–49).

The 20th century witnessed a breakthrough in antibiotics and successful vaccination campaigns nearly eradicating TB. Nevertheless, to this day the disease remains an important factor in mortality in developing countries, and among immunosuppressed subpopulations. In 2014, TB still claimed lives of 40 elderly individuals (>65 yrs.) in Finland, which represents c. 0.08 % of the total of deaths in the country during that year (OSF 2015B). An estimated one third of the world’s
population is infected with this chronic, biphasic disease. Alarmingly, the incidence of multidrug-resistant TB is on the rise due to improper treatment practices. (WHO 2014, 1, 10; WHO 2015).
3 Results

Computed tomography (CT) provides an efficient non-invasive means to examine mummified human remains. The CT study of the remains of Vicar Rungius demonstrated that this method widely utilized by international mummy researchers, is also applicable to the research of the spontaneously mummified remains found beneath Finnish churches. It aided in deriving information about the anthropometric features and health of the Vicar, but also about the preservation of his mummified remains. It simultaneously preserved their attributes in digital form. (I; II; III; IV.)

In addition, stable isotope analyses were utilized to trace the typical diet at the time. The results of the relative frequencies of the nitrogen and carbon stable isotopes in the Vicar’s nail keratin were compared to the corresponding results of the early modern local control population (N = 12).

3.1 Preservation of the remains of Vicar Rungius

The mummified remains believed to be those of Vicar Rungius are externally in relatively good condition (Fig. 1; II). To an extent, even the facial features are still identifiable. However, the eyes along with the eyelids and majority of the soft tissue structures of the nose have decomposed leaving both the orbits and the nasal cavity exposed. In addition, the external ears have vanished. The remnants of the skin surrounding the ear canals, as well as the scalp, are ragged and revealed parts of the cranium. At least partially related to the poor preservation of the scalp, no hair has preserved (V) although the body hair is also missing, or may alternatively be covered by decomposed remains of clothing. The lips tightly attached to the front teeth (IV) are still present, but have lost any former fullness.

The right forearm of the mummy has been detached at least since the 1860s (I). Both forearms were once crossed over the chest of the mummy lying in a supine position. Once the stomach deflated due to post-mortem changes, the arms had already dried up, and thus, remained in their place so that the mummy appears to be holding his remaining left forearm lifted above his torso. (II.) Most nails on the toes, as well as on the fingers of the remaining hand, are present, although some have apparently fused together with the skin below so that the tissues are no longer clearly distinguishable from each other. (Fig. 1)

The mummy has maintained the human form rather well. The visible ventral side is nearly intact. There are, however, some large tears in the skin, which has
shrunken, and turned leathery and brown. This is typically seen in dehydrated mummified remains (e.g. Janaway, Percival & Wilson 2009, 329; Prahlow 2010, 175, 177). Some defects on the rear could only be examined using the scans, as during the course of this examination, the mummy was not turned, nor lifted from the coffin. (II)

The CT scans also revealed that the right forearm is not the only missing body part, but also the cervical vertebrae from 1st to 6th, and thus, practically the whole neck is no longer present, leaving an impression of the head being detached from the body (I; II). An external observation alone gave the impression of the neck being unusually short, but its actual state only became obvious after the scan. Although it was initially thought that the head had become fully detached, ultimately it could be relatively confidently determined that the head and torso are still conjoined by a continuous strip of soft tissue in the neck (I).

The scans also allowed for the examination of the internal organs and other structures, which, nevertheless, have decomposed for the most part. Yet outlines of some organs could be identified, as some traces of connective tissues are still present. For example, some membranes on the lungs, meninges and the structures of the heart ventricles, along with remains of calcified arteries and veins are still present. The tissues of muscles have mostly decomposed, but some tendons and ligaments have mummified, thus making the structures of certain major muscles identifiable. (II)

In addition to the dissolution of the muscles and intestinal tissues due to the processes of decomposition, signs of rodent activity destroying the remains both externally and internally were evident (I; II; III). These changes will be further pondered upon in the subchapter 3.3.2 Ambiguous findings.

3.2 Stature and body weight estimations

The CT scans were utilized to estimate the body size of Vicar Rungiis. The maximum length from the mummy’s exposed bregma to the inferior calcanei was measured as approximately 163 cm (5.42 ft.). This, however, was not the actual living stature of Vicar Rungiis, as most cervical vertebrae are missing and the soft tissues of his remains are dehydrated. Corrections were made in order to reconstruct the actual stature. Therefore 13.7 cm – a figure comprising of 9.2 cm for the combined height the cervical vertebrae 1–6 in an average male, 3.5 cm to cover for the height of the missing intervertebral discs, and 1 cm for the soft tissue shrinkage
were added. As a result, the living stature for Vicar Rungius was estimated to have been about 176.7 cm (5.80 ft.). (II)

The stature estimation and the maximal breadth measured between both iliac spines (bi-iliac breadth, BIB) of the mummy allowed for the estimation of the Vicar’s ideal body weight. The estimation was performed using an equation\(^{24}\) developed by Ruff et al. (2005). Due to soft tissue shrinkage, the bi-iliac breadth measured from the scans (28 cm) represents skeletal instead of living bi-iliac breadth, and it was converted to correspond to the latter using another equation\(^{25}\) introduced by Ruff et al. (1997). The calculations resulted in a living bi-iliac breadth of 29.76 cm, which was applied to the first equation to estimate the body weight. The result indicated a weight of 74.7 kg (164.7 lbs). However, as mentioned, this method only estimated the ideal body weight for the Vicar’s skeletal frame, and did not account for the variation in the amount of muscle mass, or adipose tissue, which are both greatly affected by nutrition, health, and even by lifestyle choices. (II)

### 3.3 Vicar Rungius’ health

The external examination did not reveal any pathological lesions or physical abnormalities. Using the scans, some pathological findings were, nevertheless, made. These findings indicate that Vicar Rungius suffered from some medical conditions, which may have impaired his health and effected his well-being; yet, not all the findings were surprising considering his age. He is believed to have died in his seventies, which was not contradicted by the examination of the exposed suture closures, or the morphology of the pubic symphysis (Meindl & Lovejoy 1985; Brooks & Suchey 1990), that was evaluated using the CT scans.

In addition, some other interesting findings were made that are non-pathological. Rather, they may be categorized either as benign structural peculiarities, or non-metric traits that represent the morphological variation in normal human anatomy.

\(^{24}\) Body weight = 0.422 × Stature + 3.126 × (living) BIB – 92.9, \(r = 0.913\), SEE = 3.7 (1)

\(^{25}\) Living BIB = 1.17 × skeletal BIB – 3 cm (2)
3.3.1 General pathology findings

To begin with, a lesion typically seen in Forestier’s disease (DISH) is manifested in the lower thoracic spine (T6–11) of Vicar Rungiūs (II). Such a lesion typically ossifies the right anterior longitudinal ligament which then causes several vertebrae to fuse together. Due to the pulsating descending thoracic aorta, the left side is normally less afflicted in individuals with normal cardiac anatomy (Resnick & Niwayama 1976; Belanger & Rowe 2001; Taljanovic et al. 2009). Additionally, the ligaments of the mummy’s right Pectoralis major muscle have calcified, and entesophytes are present in the Achilles tendon, as well as plantar fascia ligament attachments of the calcaneal bones. Extra bone had formed in the pelvic region as well. (II.) Findings such as these are typically associated with DISH (Resnick, Shaul & Robins 1975; Mader et al. 2009; Mader, Verlaan & Buskila 2013.)

His leg arteries and veins showed slight calcification. Overall, the joints are in good condition although minor lipping related to osteoarthritis (OA) was observed in the acetabula. Also, the subchondral bone in medial compartments of the knees is slightly sclerotic, and small osteophytes are present in the joint margins. Furthermore, some larger osteophytes in the vertebral margins and protrusions of intervertebral discs (Schmorl’s nodes) into vertebral bodies were detected. (II)

The fourth and fifth thoracic vertebral bodies had collapsed anteriorly, which caused an approx. 20-degree kyphotic angulation; the anterior wall of the vertebrae is approx. 60% of the posterior wall height. Borders of the lesion are sclerotic which implies an infectious origin. The lesion may represent a Pott’s spine caused by a tuberculous infection in the spine. Other findings that may be of interest in terms of the TB diagnosis are large irregular bilateral subareolar gland-like calcified masses, calcified matter in the scrotum and a mediastinal radiopaque spot next to trachea, which may represent a calcified thoracic lymph node. (II; III)

The mastoid processes of the temporal bones are asymmetrical. The left is smaller with the presence of some calcification and structural disturbance. However, there are no signs of active ear infection (acute otitis media) (II), which often infects parts of the mastoid processes. If spreading, it can become chronic osteitis, which may damage the mastoidal structures, and sometimes even cause bone perforations to discharge the pus either externally, or – in more serious cases – inside the braincase (Moody Antonio & Brackmann 2004, 331). However, no such signs were observed, nor could an explanation for this asymmetry be discovered.

26 Diagnostic qualification is minimum of four vertebrae.
3.3.2 Ambiguous findings

In addition to the actual pathological findings, some atypical anatomical features or benign changes were found in the scans. For example, a bubble-like lesion with sclerotic margins was observed inside the left femoral head. Although its aetiology is unclear, it may be an enostosis or enchondroma, both of which are benign, typically asymptomatic bony changes. This is not the only observed bony anomaly of benign nature as in addition a small bony spur of about half a centimetre – possibly an osteoma – is present on the lateral aspect of the distal diaphysis of the right humerus. Also, a non-metric trait called a torus palatinus, which is a bony protuberance of the hard palate, was observed. (II; IV.) It is a rather common feature, although the prevalence varies between populations (Hrdlicka 1940; Hiremath, Husein & Mishra 2011).

Additionally, radiopaque objects were encountered that were bilaterally embedded in the internal soft tissues of the back approximately in the renal region. Initially, they were considered to be kidney stones. This is, however, unlikely as the findings are radiographically unsuitably dense. They are also not located exactly in the anatomically correct area of the kidneys; the organs’ outlines can still be traced in the scans. On the other hand, the mummy has been moved and shifted, which may have dislodged any possible kidney stones.

A more plausible explanation would be that these objects were carried inside the remains from an exogenous origin. They may represent consequences of rodent activity of which there were also other signs. For example, a rather sizeable construction of granular matter in the thoracic cavity has destroyed the majority of the mummy’s pulmonary structures. Although first speculated whether it is a calcified pleura, which sometimes occur in pulmonary TB, it now is rather believed to be an old rodent lair. (II; III.) There are relatively large tears on the skin of the mummy facilitating the small animals passing inside the remains and the scans revealed passage ways from outside leading to this particular region. What is more, these are not the only mummified remains within which structures suggesting rodent activity have been found. (Väre et al. 2016.)

Yet more of a radiopaque substance of unknown origin with calcified appearance was also observed inside the trachea, bronchus and urethra. This may be the remnants of the organs or other internal structures broken and shifted while the mummy has been lifted and moved. Also, material interpreted as possible coprolithic matter is still present in the rectal area (II).
3.3.3 Dental health

Vicar Rungius is missing three molars. Both third maxillary molars (18 and 28 according to the ISO standard for dentists) were lost *antemortem*, but whether even the right maxillary second molar (17) has fallen out or was extracted prior to death is uncertain. Its socket is open, and the bone unhealed, but a possible incipient periapical abscess observed in the alveolar bone might have been responsible for a need to pull out the tooth shortly before the death. The other missing teeth must have been lost well before death: their sockets have disappeared due to the healing of the alveolar bone. Another possibility is that both the maxillary wisdom teeth were congenitally missing. The scans show that they are not inside the alveolar bone. Moreover, the left third mandibular molar (38) was supererupted, and worn considerably less than the other lower molars indicating a long-term absence of its maxillary antagonist (28). (IV)

Three carious lesions were detected, but the robust resolution of the scans may have prevented observations of further incipient cavities. Furthermore, it is plausible that the missing teeth had been afflicted by decay, and hence removed. Two of the carious lesions (27 and 38) were severe, extending to the pulp chamber, while one (46) was superficial, merely affecting the enamel. (IV)

The slice thickness of the imaging protocol also hindered the estimation of the degree and severity of the periodontal disease, although it was evident that the condition had caused bone loss in both the maxilla and mandible. The alveolar bone is remodelled and irregular indicating inflammation, especially on the left lingual side of maxilla, particularly around the carious left second molar (27). Even a possible periapical abscess had formed in its alveolar bone. (IV)

No signs of hypoplasia, occupational use of dentition, nor hypercementosis are present. Finally, the anterior teeth are crowded. The left first mandibular and maxillary molars (36 and 26) even feature peculiar, matching lesions, which may have been initiated by chipping off a part of crown. As a result, only the opposing surface of its antagonist would have been worn causing asymmetry in both teeth. (IV)

3.4 Stable isotope analyses

The stable isotope analyses of Vicar Rungius’ nail keratin revealed information about his nutrition about 6 to 12 months prior to his death. The analyses of the hair and nail samples of the control population from Kemi and Haukipudas parishes
reveal the dietary information of approximately the corresponding period prior to their death. The δ13C values of the mummified individuals fell between -22.0‰ and -19.6‰ (-20.55 ±0.67‰), which points towards a diet acquired from a terrestrial C3-plant environment utilizing both C3-plants, and the meat of herbivores that fed on them. However, at 10.6–14.6‰ (12.91 ±0.91‰), the δ15N values are high in comparison to modern values particularly in Western Europe (Table 3), but also for a diet involving exclusively livestock and game meat with plant foods. They rather suggest the utilization of dietary protein from aquatic environments, where food chains are longer and more complex, which causes an elevation in nitrogen values (Schoeninger & DeNiro 1984; Schulting 1998).

The two tailed Independent Samples T-test\(^{27}\) showed that both the δ13C and δ15N values are similar in mummified individuals from Keminmaa and Haukipudas (Vicar Rungius excluded: \(p = 0.715\) and \(p = 0.807\), respectively), which allows them to be handled as a single population while comparing the values to those of Vicar Rungius (Table 3). The comparison shows that the δ13C value of Vicar Rungius did not differ from the rest of the population \((p = 0.613)\), while his δ15N value was significantly higher than those of the other individuals \((p = 0.047)\).

Table 3. Keratin stable isotope analyses of the mummified individuals in comparison to some modern European populations

<table>
<thead>
<tr>
<th>Populations</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>δ13C‰</td>
<td></td>
<td>δ15N‰</td>
<td></td>
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<td></td>
<td>(VPDB)</td>
<td></td>
<td>(AIR)</td>
<td></td>
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<tr>
<td>Kemi &amp; Haukipudas mummies (N=12)</td>
<td>-20.58</td>
<td>0.7</td>
<td>12.77</td>
<td>0.8</td>
</tr>
<tr>
<td>Vicar Rungius</td>
<td>-20.20</td>
<td></td>
<td>14.60</td>
<td></td>
</tr>
<tr>
<td>Modern Finns (N=20) (Arppe 2016)</td>
<td>-21.99</td>
<td>0.6</td>
<td>11.21</td>
<td>0.5</td>
</tr>
<tr>
<td>Modern Finns (N=3) (Valenzuela et al. 2012)</td>
<td>-22.06</td>
<td>0.6</td>
<td>10.16</td>
<td>0.3</td>
</tr>
<tr>
<td>Modern Western Europe (N=129) (Valenzuela et al. 2012)</td>
<td>-20.36</td>
<td>0.8</td>
<td>9.26</td>
<td>0.5</td>
</tr>
</tbody>
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\(^{27}\) 95 % level of confidence.

\(^{28}\) N = 126.

\(^{29}\) N = 16. The hair samples collected from modern Finns were not prepared in any way before the analyses (for comparison see pp. 28–29).
4 Discussion

4.1 The famous mummy of Vicar Rungius

4.1.1 Mummy as a monument

Vicar Rungius is still a well-known character locally. The parishioners must have become aware of the mumification of his remains by 1704 when his original coffin was replaced by a new one (The Church’s income and expenditure accounts 1700–1716 [Oct. 9, 1704] IIITI:2, General ledger, Archives of Kemi parish, OMA). By then, the mummy already dated further back than the memory most parishioners held. However, these remains, and those of several others, resting beneath the parishioners’ feet, were not forgotten, but in a perceptible way a part of their everyday lives and collective memory, making the past and the present collide. (Symonds et al. 2015, 81; Nielsen 2008, 208–210.)

The remains of Vicar Rungius have still been treated in an unusual way; instead of burying and ultimately forgetting the private corpse of this one-time vicar, the attention it has received over time has turned it into public property. The vicar, already long gone, has been kept alive through the gazes of successions of generations. At the same time, his mummy has offered its viewers a glance into history, and evidently has functioned as a certain representative of the local people. It is also a rather rich source of folklore explaining the preservation or discussing the fate of the missing forearm (e.g. Calamnius 1868, 201–202; Castrén 1894, 58; Fellman 1906, 324; Cajanus 1927, 28; Kallinen 1990, 128, 131–133; I).

The temporally extensive tradition of exhibiting the remains of Vicar Rungius perhaps allows them to be assessed through the framework of socially constructed meanings of monuments and memorials. The significance of these particular remains, and the stories connected to them, may be compared to those of more traditional, built monuments or memorials. Typically, social interpretations of the past are attached to them. Their apparent permanence displays them as impartial recorders of the past, albeit they symbolically express and legitimize those versions of history that have been deliberately chosen. In this respect, they mirror current events, ideas, and issues by simultaneously revealing what is hoped to be preserved for the future. They also help establishing ideological, religious or political authorities and traditions. (e.g. Alderman & Dwyer 2009, 51–52, 56; Knapp 2009, 47–49; Jeremiah 2014, 85.)
This analogy is not fallacious even when applied to remains that once belonged to a living person instead of a structure. After all, memorials, indeed, are often graves of great men or women of history – and their graves are, by default, assumed to contain their dead bodies. In certain cultures, even mummified bodies or body parts have functioned as religious items or memorials of respected ancestors (e.g. Jeremiah 2014, 85; Nielsen 2008, 2010–212; Aufderheide 2010, 111).

The mummy of the Vicar has undoubtedly functioned as a delegate of the Church’s authority, and as such, even as a rather convincing narrator of the biblical truth. Throughout the centuries, it has induced powerful experiences, and in this manner, it has verified the Christian doctrine in a corresponding fashion to the incorruptible saints of the Catholic tradition. What is more, these meanings connected to the mummy have been further substantiated by the religiously inclined legends explaining its miraculous preservation. (Kallinen 1990, 132; I)

Monuments and memorials play an important role in constructing identities and creating a sense of belonging (Alderman & Dwyer 2009, 56; Knapp 2009, 47). Narratives such as those connected to the mummy can create unity and cohesion between people (Abrahams 1968). However, the significance of any memorial or monument is rewritten from one generation to another, or it may vary between social or demographic groups. This in turn implies that the meanings connected to them – and indeed, the remains – are not fixed, or always in accordance with what is formally indented, but that they interact with varying social needs and ideologies. Hence, they must be contextually perceived. Further still, monuments or memorials often help to make the past better known and typically have a distinctive role as tourist attraction. (Alderman & Dwyer 2009, 56; Knapp 2009, 47–49.) Furthermore, the remains of Vicar Rungius continue to be an important attraction to tourists passing by, or heading to the Kemi area during summer (Kallinen 1990, 131; I). At the same time, they make the beautiful and rather unique old church of Keminmaa better known among the visitors.

**4.1.2 Authenticity**

This thesis rests on the hypothesis that the mummified remains being discussed truly are those of Vicar Rungius, when, in fact, there is nothing to prove this. The belief is mainly corroborated by the local tradition, and the two early 18th-century documents mentioning the Vicar’s grave or preserved remains (The Church’s income and expenditure accounts 1700–1716 [Oct. 9, 1704] IITI: 2, General ledger, Archives of Kemi parish, OMA; List of graves 1728–1728 IAI: 1, Documents
concerning the churchyard and chapel, Archives of Kemi parish, OMA; Cajanus 1927, 28–29).

Both these documents date to less than a century after his death. Indeed, it is unlikely that during these first decades succeeding his passing there would have been a need to falsify, or to retouch the remains. On the other hand, since the 19th century, their importance as an advocate for the Christian faith increased as the fame of the miraculously preserved mummy began to spread through the stories written down by the priests and journalists at the time (e.g. Calamnius 1868, 201–202; Fellman 1906, 324; Cajanus 1927, 28; Itkonen 1976, 14–16; Kaiku 1887, 3; Jakobstads Tidning 1900, 3). In such circumstances, any major damage to the mummy may have urged its repair in order to maintain the important religious implications connected to it (I). Enhancing and fabricating mummified remains functioning to reinforce the establishment has certainly happened in the past (e.g. Aufderheide 2010, 159–161, 534–536; UAB 2008).

Vicar Rungius’s remains did not present any evidence of manipulation beyond the presumably unintentional damages to the forearm and neck. Nevertheless, what brought about concerns regarding the originality were the missing cervical vertebrae, the damaged soft tissues of the neck and the head that was placed directly on the caudal end of the rib cage of the Vicar laying in supine position. The meticulous examination of the scans, however, confirmed that although the skin and other tissues are badly torn in the neck and back regions, the head and torso seem to be interconnected. This would rather reliably prove that the mummy – although damaged – was not enhanced with an additional head but the whole body had, in fact, probably belonged to a one single person. (I)

However, it is common for the heads to become detached during the handling of mummified remains. The joints of the upper spine were some of the first to become disarticulated during the decaying process in experiments conducted using the carcasses of wild boars (Cameron & Oxenham 2012). As the rear of Vicar Rungius is not visible without moving the mummy, it is impossible to tell conclusively whether the separate fragments are actually continuous or simply over-lapping. Furthermore, the mummy may still have been repaired by reattaching the separate body parts. Evidences of similar activities have been observed in mummies elsewhere (e.g. Aufderheide 2009). It is possible that the head would have become detached from the torso at the articulation between the cervical vertebrae 6 and 7, before the head was restored to the body, for example, by sewing.

In any case, it still is not clear whose remains are actually resting in the old church of Keminmaa. It is likely that they did belong to Vicar Rungius, but with
the currently available, permitted and ethically sustainable methods, their former owner’s true identity unfortunately seems to be beyond proof. A radiocarbon analysis could have provided an approximate dating for the remains. However, all the individuals buried in the premises date to a relatively short period of time. This means that the date range of the analysis would likely have covered a substantial proportion of this period. This, in turn, makes the method unable to clearly distinguish the Vicar from the rest of the individuals buried in the old church. What is more, it was decided that the use of any invasive methods would be kept to a minimum.

Fig. 4. The CT scans of the Vicar’s pubic symphysis were not useful in precisely determining his age at death.

Instead, a further confirmation of the identity was pursued by estimating the skeletal age of the remains using the most suitable standard osteological method. As the scalp is missing, the cranial suture closures of the calotte could be evaluated rather easily (see Meindl & Lovejoy 1985). The degree of their fusion is consistent

30 The scans were examined in cooperation with PhD Heli Maijanen and Prof. Jaakko Niinimäki at the Oulu University Hospital.
with the prior information concerning the age of Vicar Rungius (Fig. 1), but the unreliability of this method should be acknowledged (II). Thus, attempts were made to confirm the age by examining the pubic symphysis in the CT scans (Brooks & Suchey 1990). However, estimating the age of elderly people is notoriously difficult, and the quality of the scans only allowed for conclusion that the overall appearance of the pubic symphysis did not contradict the supposition that the remains were those of a male individual in his late sixties or early seventies (Fig. 4).

Secretively replacing the corpse with another would probably have been challenging after the awareness of the mummy had increased in the 19th century, but then again, likely rather futile prior to it. Moreover, the mummy’s right forearm was already missing in the mid-19th century (Calamnius 1868, 201). This indicates that the mummy has been the same at least since then.

In addition to merely pondering the authenticity of the remains, the credibility of the legends that have formed around them should also be considered. For example, the story about the Vicar preaching that his body would not perish after his death if his sermons were true is typically dismissed as a fabrication that was only concocted to boost up the Gospel once the state of the remains was obvious. Nevertheless, Vicar Rungius and his contemporaries probably were already aware of the mumification taking place in the church graves. At very least, other priests were likely buried underneath the church before Vicar Rungius (Paavola 1997, 4; 1998, 77–78, 146, 162). Perhaps he was really expecting his remains to mummify, and may even have believed that the preservation of flesh in these circumstances was a testament of divine intervention (I). Nevertheless, before modern science, such was considered a fair explanation for inexplicable occurrences presently known to be natural (e.g. Numbers 2003, 265–266; I). The separation between body and soul was not clear. This may have led to the mumification becoming the preferred outcome of burial to aid in the resurrection (Paavola 1998, 43–45, 146–147, 166, 262; Piombino-Mascali et al. 2010, 357; Jeremiah 2014, 94). However, in the absence of transcripts from Vicar Rungius’s sermons, it is impossible to tell whether he had really preached this, or if it is a later fabrication. (I)

Another interesting story is about a visitor stealing the missing right forearm. In the past, human remains were highly valued items, as they were used for medicinal, but also magical purposes, and sometimes even stolen from mortuaries or unkempt churchyards (Heikkinen 1969, 27–34; Sarmela 1994, 58–59; Tittonen 2008). For several centuries, the Egyptian mummies, or pieces of them, had systematically been looted as souvenirs, charms and talismans to various parts of
the globe (Aufderheide 2010, 518–521). Still by the 19th century, a painting pigment, appropriately named “mummy brown”, contained ground body parts of mummified corpses (Woodcock 1996). Moreover, in the Catholic world, the alleged body parts of saints were important merchandise (Jeremiah 2014, 94–95).

On the other hand, an example of a story that simply could not be true is the one about the card playing men who allegedly used the mummy’s mouth as a splint holder (Borg 1944; Kallinen 1990, 128). The mouth of the mummy, namely, is closed, and the mummified lips are tightly attached to the partially revealed incisors, which means that placing anything in the mouth, let alone having the jaws drop open, is impossible.

4.2 The health of Vicar Rungius

4.2.1 Tuberculosis or something else?

Findings in the CT scans indicated that Vicar Rungius may have suffered from a tuberculous infection. The most compelling evidence of this was the lesion in his spine that had collapsed the anterior portions of his fourth and fifth thoracic vertebrae. (II; III.) Similar lesions, also known as Pott’s spine, afflicting particularly the anterior portions of vertebrae are typical findings in skeletal forms of TB (e.g. Teo & Peh 2004). In conditions lacking proper medical care, the disease affects the skeleton in approx. 5 to 7 % of cases, of which c. 40 % manifest in the spine. The presence of a Pott’s spine has previously been accepted as a rather reliable evidence of the presence of TB in palaeopathological settings when the regional antiquity of the disease is considered. (Aufderheide & Rodriguez-Martin 2011, 121–123, 125, 133; II; III)

Although the finding in the Vicar’s spine is likely caused by TB, other suitable candidates in differential diagnosis are pathogens such as Staphylococcus aureus (Gouliouris et al. 2010), and in certain geographical regions, for example, species of fungi (Blastomyces dermatididis) may cause a similar lesion (Saccente et al. 1998). The latter, however, would not be a concern for an early 17th century Northern Finnish vicar. (III.) Even the DISH, from which he did suffer (II), may have predisposed him to spinal fractures. It is linked to fractures in the spine that may sometimes form into pseudoankyloses resembling pathogen-induced lesions (Manaster, May & Disler 2013, 272–273; Diederichs et al. 2011; Taljanovic et al. 2009).
Another finding that could be interpreted to have been caused by TB is the calcified mass detected inside his scrotum (II; III). Scrotal calcifications sometimes occur in genital TB, which typically spreads from the kidneys (Gorse & Belshe 1985; Muttarak et al. 2001; Golden & Vikram 2005). Thus, it may even be connected to the radiopaque objects detected near the renal region31 of the mummy (II) as renal calculi frequently occur in connection to TB of kidneys (e.g. Dolev, Bass & Nussinowitz 1985; Eastwood, Corbishley & Grange 2001).

Scrotal calculi, however, are not a particularly unusual finding as they can also result from various other conditions besides TB. One of them is diabetes mellitus, which would be in line with the diagnoses related to Vicar Rungius’s presumed overweight. On the other hand, they may even be associated with malignancies, which, however, are unlikely given the Vicar’s mature age. Cancers of testes are typically encountered in younger men: in the absence of modern treatment methods they tend to metastasize, and eventually lead to death (Peckham et al. 1983; Martin & Tubiana 1988; Muttarak et al. 2001; Hayes-Lattin & Nichols 2009). Similar calcifications can also develop as a consequence of inflammations, haematomas and repeated micro-traumas, or testicular torsion (Artas & Orhan 2007).

Furthermore, the calcified bilateral subareolar breast masses could be explained by tuberculous mastitis, which is a tuberculosis infection of the breasts (III). Although it presently is a very rare condition (Thompson et al. 1997; Shi et al. 2005; Marinopoulos et al. 2012), it may have been more common in the past conditions lacking any effective curing methods (III).

Nevertheless, gynaecomastia is perhaps a more likely explanation for these bilateral findings (III). This normally benign condition is currently common in elderly men with lowering serum testosterone levels, and it typically occurs bilaterally. Gynaecomastia may also develop consequently to testicular tumours – a diagnosis that would compound with the finding of testicular calcifications. (Johnson & Murad 2009; Carlson 2011; Hassan et al. 2008.) The tissue mass related to gynaecomastia does not normally calcify, but in the late chronic stage it is characterized by the formation of dense fibrosis (Rohrich et al. 2003). Fibrotic tissue, in turn, tolerates taphonomic processes rather well, while acute inflammatory reactions necessarily do not (Zimmerman 1979; Ventura et al. 2014). Interestingly Aufderheide (2010, 497) reported that by the turn of the 21st century no cases of this presently fairly common condition had been found in the studies of mummified remains. Attempts at tracing it have, however, been made as, for

31 See also p. 71.
example, artistic depictions of the Egyptian King Tutankhamun have implied that he may have been affected by the condition (see Hawass et al. 2010; III).

Another unlikely cause could be breast cancer (III). It is rare in men, especially given that the lesion is bilateral, although most cases of male breast cancer are diagnosed in the elderly. Furthermore, while considering the cause for lesions presenting with calcifications, also haemangiomas, trauma-induced fat necrosis causing heterotopic ossification, and – in certain locations, although not in Finnish Lapland, even parasitic infections should be included in the differential diagnosis (Shi et al. 2005; Tauro et al. 2011).

The radiopaque matter next to trachea possibly representing a calcified lymph node could point to a pulmonary infection perhaps caused by TB (Aufderheide & Rodriguez-Martin 2011, 133; II; III). In the absence of most lung tissues, it is not reasonable further to consider the presence of such an infection: extra-pulmonary TB does not always occur in connection with pulmonary involvement (CDC 2014, 74–75). Moreover, tuberculous mastitis can affect the regional lymph nodes (Tauro et al. 2011). On the other hand, it is possible that this finding may have resulted from taphonomic changes related to the substance observed inside the respiratory tract (II), which would have shifted when the mummy was lifted (III).

Whether Vicar Rungius was tuberculous may never be confirmed, although especially his spinal lesion would imply it. First of all, it is unsure whether the finding may be labelled as a Pott’s spine, as these spinal lesions are not pathognomonic to TB (Aufderheide & Rodriguez-Martin 2011, 125). Moreover, the other findings are not sufficient to confirm multi-local tuberculous involvement.

Vicar Rungius’s possible TB is relevant considering his personal life history, but also the history of the disease in Finland. By the Vicar’s time, it had almost certainly been in the region for several centuries. The disease’s initial expansion and it becoming endemic has been linked with the Neolithization and growth in population density. Later, the early modern urbanization and increasingly cramped living-conditions further advanced its spread causing a substantial rise in its prevalence. (Hershkovitz et al. 2008; Aufderheide & Rodriguez-Martin 2011, 126, 129; Comas et al. 2013.)

In the Swedish Kingdom, the first skeletal evidence of TB dates to the 12th century (Fürst 1920, 19, 58, Fig. 14, 15, 44 & 45; Savonen 1931, 10–11; Bergmark 1983, 237), and a document from the early 15th century discusses TB incidences in local convents (Vuorinen 2000, 144; Vuorinen 2002, 172). However, the disease was present much earlier, as *MTBC* DNA was successfully extracted from Neolithic bones in Southern Sweden (Nuorala et al. 2004). While the date of the disease’s
arrival in Finland is unknown, by the Middle Ages the town of Turku (Fig. 2) was well connected with the Swedish motherland. Urbanization in the rest of Finland took place comparatively late, and a subsequent rise in TB deaths only began in the late 18th century (Ilmoni 1853, 588). The increase in their number would not cease before the 1870s (Vuorinen 2002, 176), and still in the beginning of the 20th century, TB was almost universally contracted by early adulthood (Savonen 1937, 39–46, 67–68; Vuorinen 2001). By the 1920s, the fight against it had clearly been more successful in other Nordic countries (Savonen 1931, 15–17; Savonen 1937, 57).

Potential palaeopathological TB diagnoses have been made in the skeletal material excavated in Renko and Porvoo churchyards dating to the 16th to 19th, and 14th to 18th centuries, respectively, and in Turku in the churchyard of a former poor house dating to the 16th–17th century32 (Salo 2007; Salo 2016, 14, 29, 48, 60, 344–353). All these sites (Fig. 2) are located near the Vicar’s home in the Turku region. The primary infection is usually contracted in childhood (Aufderheide & Rodriguez 2011, 119), and if Vicar Rungius was tuberculous, he was probably infected already in his home region (III).

However, no Northern Finnish TB cases contemporaneous with Vicar Rungius have previously been confirmed. The situation during the early 17th century cannot be traced as diseases were not yet monitored. Thus, the void of evidence of the disease’s presence in Finland is due to lack of early documents and suitable archaeological skeletal materials rather than the lack of actual cases. Only from the mid-18th century onwards can a general picture of the deadly diseases and conditions be acquired using the death records. By then, TB was already a rather common cause of death in the Kemi parish especially in the age group corresponding to that of Vicar Rungius (see subchapter 2.4.2 Diseases and death in Kemi parish in 1698–1797).

This earliest available data unfortunately coincides with the period of increase in TB deaths (Ilmoni 1853, 588; Vuorinen 2002, 176). Thus, the picture it provides may be misleading in terms of the situation more than a hundred years before, when the disease was probably not as common. Yet, as mentioned, the actual incidence of TB cannot be deduced by the mortality caused by it. As a biphasic, chronic disease it often had no time to progress to fatality before other, more acute conditions caused the death. Even today, one third of the human population is infected with TB, yet only in a tenth of cases will it develop beyond the typically

32 Same skeletal sample mentioned on p. 91.
asymptomatic primary form. Hence, it may be that the actual incidence of TB infections in the late 18th-century Kemi parish was much higher than death registers would indicate.

4.2.2 Impact of the observed pathological conditions

Some of the Vicar Rungius’s pathological findings were probably symptomatic, therefore having had an effect on the quality of his life. DISH (II) may remain completely asymptomatic, and in fact, often emerges as a coincidental finding in radiological examination. Moreover, most clinical symptoms related to the condition are typically not very severe. They may include discomfort in forms of spinal stiffness, restriction of mobility, or intermittent non-radiating thoracolumbar pain. (e.g. Resnick & Niwayama 1976; Taljanovic et al. 2009; Mader et al. 2009; Mader, Verlaan & Buskila 2013.) In addition, more severe complications can, however, emerge. Even acute spinal fractures may occur sometimes leading to serious consequences including deformity, non-union, neurologic injury and even death (Paley et al. 1991; Sharma et al. 2001; Taljanovic et al. 2009). Due to the baseline level discomfort sometimes connected to the condition, a diagnosis of vertebral fractures may be delayed. These fractures frequently follow a seemingly minor trauma, and the often unrecognized instability, as well as the deterioration in the spinal structures may cause subsequent spinal cord injuries (Belanger & Rowe 2001).

The bony projections and ossifications in enthesial sites that were probably connected to DISH (II) can also be painful and cause motion restriction and stiffness in extra-spinal articulations (Mader et al. 2009; Mader, Verlaan & Buskila 2013). On the other hand, the enthesopathies in the hip region that occur in relation to DISH are typically asymptomatic (Fahrer et al. 1989).

Both large osteophytes and Schmorl’s nodes were detected in the Vicar’s spine (II). Although also these are typically asymptomatic, they sometimes inflict restriction or pain. Both are rather common findings, and in particular, osteophyte formation in vertebrae is age-related, and thus, not extraordinary considering Vicar Rungius’s apparent maturity (e.g. Rogers & Waldron 1995, 25–27; Prescher 1998).

The vertebrae were not the only joints that had been affected by degenerative changes. The Vicar’s acetabula and medial compartments of the knees showed minor signs of OA (II). Nevertheless, it is again difficult to tell whether such changes caused symptoms or not. Sometimes, a patient with very painful joints exhibits only slight radiographic changes while a person with coincidental finding
of major lesions can be completely asymptomatic (Rogers & Waldron 1995, 101–103; Odding et al. 1998).

By contrast, the supposedly infectious lesion in the Vicar’s thoracic vertebrae certainly would have been painful, and probably responsible for severe chronic backaches, even if it was not connected to TB (III). Moreover, it probably lowered the Vicar’s stature by some centimetres, while causing a slight kyphosis tilting forward his shoulders. Sometimes similar lesions have much more severe effects. For example, infections in the vertebrae or the related soft tissues may put pressure on the spinal cord and therefore lead to neurological problems (e.g. Darouiche et al. 1992; Akalan & Özgen 2000; Hidalgo & Alangaden 2014; III). A spinal cord defect in the region of the 4th and 5th vertebrae, which is the location of Vicar Rungius’s collapse lesion, would initially cause numbness, and loss of strength, but could ultimately inflict even paralysis of the lower extremities. On the other hand, some pathogen-induced spinal lesions may even cause sepsis, which in conditions lacking proper medical care invariably leads to death.

If, indeed, it can be interpreted that Vicar Rungius had TB, its clinical presentation may have included general symptoms such as malaise, fever, night sweats and weakness. Weight-loss is also very typical, although it is not usually consequential to genitourinary TB or tuberculous mastitis, which both cause more localized symptoms. Thus, such diagnoses would not conflict with the Vicar’s assumed overweight (II). For example, TB in testicles would probably have caused tenderness and swelling, but it can also lead to infertility (Simon et al. 1977; Kapoor et al. 2008.) Tuberculous mastitis is frequently symptomatic with mastalgia and in some cases, ulcers may appear in TB-infected breasts. (Shi et al. 2005; De Sousa & Patil 2011.) The remains of Vicar Rungius, however, revealed no indication of such. Furthermore, if the lesions in either the testes or chest were caused by malignancies, which however is unlikely, the implications of such could naturally also have been serious.

Considering that the breast masses (III) were caused by benign gynaecomastia related to age-induced drop in androgen levels, which is probably the most likely explanation, the Vicar’s areolae may at some point have been tender. Any other clinical symptoms are very rare. What is more, after the condition becomes chronic, and fibrotic tissue replaces the glandular tissue, pain typically retreats (Johnson & Murad 2009). Hence, as the lesions had a calcified radiographic appearance suggesting fibrosis, it is likely that at the time of the Vicar’s death they were no longer symptomatic with pain. In modern cases, the feminized appearance of the chest is probably the most disturbing implication of the condition – especially to
adolescent boys (Kinsella et al. 2012). There is, however, no way of knowing whether the local beauty standards, and cultural gender expectations would have caused an elderly early 17th-century vicar to be bothered by the appearance of his chest. After all, the rigor in what kind of bodies can represent which gender is not a natural phenomenon but a product of cultures. The division then may have been dissimilar to the current one, or not as seriously obeyed as it is today. (Foucault 1978, 3, 5; Butler 1990, 146–149.)

What comes to the dentition of the vicar, few caries lesions were found (IV). Although initially, caries is not always painful, the pain typically increases as the disease progresses. In two of the Vicar’s carious teeth, the lesions were so extensive that they almost certainly would have inflicted at least some pain. Other symptoms may have included halitosis, but also swelling of gums, glands, and face. Although the oldest evidence of drilling rotten dental tissue dates to approximately 7,500 to 9,000 years ago (Coppa et al. 2006), in medieval and early modern Europe, removal of a painful tooth was typically the most effective treatment option available (e.g. Adams 2000, 19). It is possible that evidence of such iatrogenic interventions is observable in Vicar Rungius’ mouth (IV). While still present in the mouth, his left maxillary wisdom tooth (28) may well have been carious, and hence, affected the initiation of the large carious lesion in its neighbouring tooth (27). Such a disease process may have led to the extraction of the former. Also another tooth was certainly lost antemortem (18), and even the third (17) that is missing, has with relative certainty been lost before death: at least it has not been found inside his remains, although it may have fallen through the apertures in the neck region.

Periodontitis causes an absorption of the alveolar bone, and hence, it uncovers the roots, which may eventually cause tooth-loss. In populations with a sufficient level of dental care, adults frequently exhibit signs of periodontal disease, but children are rarely afflicted: periodontitis becomes more common as an individual ages. (Heitz-Mayfield et al. 2003.) Thus, the condition of Vicar Rungius’ dentition is comparable with most modern men in their 70s (IV). Besides the possible contribution to tooth-loss, his periodontal condition may also have caused symptoms such as bleeding and swelling of gums, bad breath, sensitivity and pain. Even the plausible abscesses in the Vicar’s mouth might be periodontitis-induced. (Armitage 1996; IV.)

In regard to the history of health, the chronic diseases are as interesting as those leading to death, as they are the conditions with which people sometimes had to live for extensive periods. They naturally affect the sick through personal suffering, but sometimes also through social stigmas, both currently, as well as in the past.
4.2.3 The death

Vicar Rungius was approximately 70 years old when he died in 1629, although there is no certainty of the exact year he was born in (e.g. Vahtola 1997b; Väänänen 2011a). There are also no archival records discussing how, or when exactly, he died. The CT study of his remains did not provide information about any certain cause of death, and in the absence of the intestines, the chances of reaching a definite conclusion in this matter are rather slim. Unfortunately, the attempts to estimate a more precise skeletal age of his remains were also unsuccessful, although the overall appearance of the relevant features did not indicate that they would have belonged to a much younger individual than expected (Fig. 1 & 4). (II)

Considering that Vicar Rungius died in his late 60s, or early 70s, he did achieve a relative longevity if compared to most of his contemporaries. In mid-18th-century Sweden, the mean life expectancy was about 34 years. Naturally, the average was this low mainly due to the massive infant mortality, and for those who did not die as children, the probability of reaching mature age was much higher. (Gurven & Kaplan 2007, 327, 332; II.) Mortality in Kemi parish can be investigated from 1698 onward. During the following hundred-year period the mean age at death was even lower than the mid-century averages in the Kingdom: for males, it was less than 20 years. However, in consideration of typical lifespan of adults, this figure is again misleading as it is biased by the infant mortality. Those living more than 16 years typically exceeded 50 years, and even elderly people were found in the material. (See subchapter 2.4.2 Diseases and death in Kemi parish in 1698–1797)
4.3 The stable isotope results and the diet

The SI values (δ13C [-22.0‰] – [-19.6‰], [-20.55] ±0.67‰; δ15N 10.6–14.6‰, 12.91 ±0.91‰) of the mummified individuals from Kemi and Haukipudas points towards a terrestrial C3-plant environment diet with a notable input of proteins likely derived from aquatic resources (see Minagawa & Wada 1984; Schoeninger & DeNiro 1984; Schulting 1998). The seemingly strong terrestrial signal suggested by the δ13C values is deceiving, and instead of reflecting a mainly terrestrial diet, it is most likely due to the influence of the local brackish sea water, which draws the δ13C values towards the terrestrial end-value (e.g. Angerbjörn et al. 2006; Enhus et al. 2011; Ukkonen et al. 2014; Danielsson et al. 2015). Both Kemi and Haukipudas parishes are located on the north-eastern coast of the Gulf of Bothnia, where the water has very low salinity. Consuming foods made of species living in local brackish and freshwater environments may easily be responsible for the high nitrogen values, although in practice, the δ13C signals obtained must represent both terrestrial and aquatic organisms. (V)

All and all, protein-containing dishes, such as meat, eggs and dairy products, derived from livestock and game, as well as fish, waterfowls and their eggs, and even seal from aquatic environments probably played an important role in the local contemporaneous diet. Even utilizing animal parts in winter-feeding the livestock may have marginally contributed in the high values (e.g. Núñez et al. [in preparation]). These interpretations comport with the prior understanding of the early modern Northern Finnish diets abundant with protein-rich foods. (e.g. Luukko 1954, 380–479; Virrankoski 1973, 179–349; Vahtola 1997a, 119–131; Bläuer 2015, 54; Vilkama, Kylli & Salmi 2016). Even the analyses of archaeological food-remains from the Northern Finnish sites agree with these considerations (Puputti 2010, 43–45; Salmi 2011, 223–228, 232; Salmi 2012, 4).

4.3.1 The early modern Northern Finnish diet and Vicar Rungius

According to the statistical analyses, the δ13C value (-20.20‰) of Vicar Rungius was similar to the values of the rest of the mummified remains (p = 0.613), but his δ15N value (14.6‰) showed significant elevation with respect to the others (p = 0.047). This elevated δ15N value calls for further elaboration. It perhaps points to

33 Approximately 0.5‰ in the northern coastal zone (Haapala and Alenius 1994; Lougheed, Filipsson & Snowball 2013).
an even more pronounced utilization of aquatic resources, and especially the consumption of the predatory species on the top of the local food chains. As mentioned, the local bodies of water offered an abundant, and evidently extensively exploited source of livelihood for the early modern coastal Northern Ostrobothnian populations. Particularly the location of Kemi by an abundant salmon river on the coast of Gulf of Bothnia was beneficial. (Luukko 1954, 354, 417; Virrankoski 1973, 300–348; Vilkuna 1974; Rytkönen 1978, 264–293; Vahtola 1997a, 120–127.) Thus, fish, and especially salmon, must have been an important part in the Vicar’s diet. He would have had an access to plenty of it since being the vicar of Kemi parish, he was entitled to the tithes of salmon (Acerbi 1802, 334; Luukko 1954, 688). Consuming the predatory salmon may have partially contributed to the elevation of his nitrogen value (V).

There may, however, be other contributors to the values such as a higher intake of omnivorous pigs that typically present higher δ15N values than other farm animals (V). They were, nevertheless, not very common in the area (Hedman 1969, 138). Even preferring the meat of unweaned young animals may partially be accountable for the values. Nursing elevates the offspring to the next trophic level, and hence also affects the nitrogen value of those consuming them (Fogel, Tuross & Owsley 1989; Schurr 1997; Herring, Saunders & Katzenberg 1998; Katzenberg, Herring & Saunders 1996). As head of his parish, Vicar Rungius would have had privileged access to goods since the vicars enjoying the various benefits of their post were often the richest members of the early modern Northern Finnish societies (Luukko 1954, 688; Virrankoski 1973, 679–687; Vahtola 1997a, 160–164). In this regard, Vicar Rungius may have consumed the meat of young animals which is typically considered superior to that of older animals. Moreover, in the past it was commonly believed, that certain ailments could be cured by eating or drinking the flesh, organs, and blood of young animals – or sometimes even mother’s milk (see e.g. Olai 2008 [1578], 29, 69; Hausen 1920). Due to his poor health indicated by some of the findings, (II; III) Vicar Rungius may have been eating such special foods during the last months of his life.

In the end, none of the aforementioned factors alone can likely explain the δ15N value as high as that of Vicar Rungius. This is even if his diet would have solely consisted of these foods, which is unlikely – especially if the nail keratin results only covering his last months are interpreted to represent a more long-term diet. However, ringed seal products may also have contributed to the elevation of his nitrogen values – albeit that hunting the animal was mostly seasonal. Seals were a profitable source of furs and blubber, but their flesh and fat was also eaten (e.g.
Luukko 1954, 437–441; Kvist 1988; Ylima unu 2000, 332). As a top predator in trophic chains of the local aquatic environments, seals have a rather high $\delta^{15}N$ level of approx. 14.5 ±0.5‰ (see e.g. Enhus et al. 2011, 7, 10), thus also enriching the values of those consuming foods made of them (e.g. Minagawa & Wada 1984). A diet with seal products even allows the inclusion of lower $\delta^{15}N$ foodstuffs, such as plant foods, in the diet even with the $\delta^{15}N$ value as high as 14.6‰. For instance, in northern indigenous populations with marine-dominated diets containing plenty of seal products, the nitrogen values of keratin tend to be even higher (e.g. Bowen et al. 2009; Buchardt, Bunch & Helin 2007).

There were probably also social constructions behind the dietary choices, which may explain the Vicar’s elevated values. These choices are not always determined by necessity or even common sense. The need to differentiate between social classes often becomes apparent in dietary choices which may function as tools of socially defined self-expression (Puputti 2010, Counihan 1999, 7–9; Scholliers 2001, 3–4). For instance, in the 16th-century royal estates of the Swedish Crown, the type and amount of nutrition the people consumed was regulated according to their rank. (Talve 1973, 110). Naturally, even the practical differences in the ability to purchase goods were considerable, and probably most effectively explain the Vicar’s dietary habits (see e.g. Virrankoski 1973, 687). Even when the rest of the population of his parish was facing weather-induced crop failures causing at least minor food disasters during the early 17th century (e.g. Vahtola 1997a, 119), there seem to have been no difficulties for the Vicar to enjoy the benefits of his post. On the contrary, in this regard it may well have been unsuitable for the vicar to consume similar nutrition to his parishioners. What is more, manifestations of DISH common in clergymen of medieval and early modern Europe believed to be connected to abundant diets such as those served in monasteries (e.g. Waldron 1985; 2009, 75–76; Rogers & Waldron 2001; Jankauskas 2003; Núñez et al. 2013, 482–484), even further tie his diet to his rank.

4.3.2 Vicar Rungius’s size, diet and state of health

The stature reconstruction that was conducted using the CT scans, as well as the physical appearance of the remains, reveal that Vicar Rungius was a rather tall, but also a robust man. Several findings suggest that he, indeed, may have consumed a rather ample diet, and probably weighed considerably more than the approx. 75 kg that the chosen body size estimation would have implied. One indicator of this was the seemingly awkward position of the left forearm (Fig. 1). As mentioned before,
both arms were probably originally crossed on the Vicar’s abdomen for the funeral. Once the mumification progressed, the arms dried in this position while the postmortem changes caused the abdomen below to deflate. Now the remaining forearm appears to be hanging in the air above the corpse, but it actually reveals the former line for the stomach. His stature was estimated to have been c. 177 cm (5.8 ft.), which would have made him comparatively tall among his contemporaries, but not exceptional considering his rather high rank (II).

The average 17th-century North and Central European men varied between approximately 161 and 166 cm (5.28 and 5.45 ft.) in height (Niskanen et al. [in preparation]). Maijanen (2006, 334) estimated the average height of the males in the 17th to 19th-century Oulu population as c. 166.9 cm (5.48 ft.). In three Southern Finnish osteoarchaeological samples from 16th to 17th-century Turku, and 17th to 18th-century Lappeenranta and Helsinki the average heights for men were 164.0 cm (5.38 ft.), 162.7 (5.34 ft.) and 168.5 (5.53 ft.), respectively (Salo 2016, 59, 90, 110). Swedish soldiers (N = 16,569) of 25–49 years of age born between 1720 and 1859 averaged at heights of 166.1–169.8 cm (5.4–5.6 ft.) depending on the decade of birth (Sandberg & Steckel 1987). About two hundred years ago, when mean statures were almost as low as during the 17th century, the 18-year-old upper class boys at English Sandhurst Royal military college were on average 173.8 cm (5.7 ft.) tall (Komlos 2007, 10). Also, the monastery inhabitants in Upper Bavaria (1700–1750) who had enjoyed relatively good living standards averaged at 171 cm (5.6 ft.), the tallest of them being 178 cm (5.8 ft.), which is comparable with Vicar Rungius’s height, but obviously tall in comparison to contemporaneous neighbouring populations with average male heights of ca. 162–165 cm (5.3–5.5 ft.) in general. (Nerlich et al. 2015.)

As an offspring of a family of the clergy (Hyötyniemi 1953, 38), Vicar Rungius probably enjoyed an abundant diet during his childhood as well. Moreover, his tallness would indicate this: disturbances in nutrition during growth are connected to short adult stature (Eveleth & Tanner 1990, 222–223; Malina, Bouchard & Bar-Or 2004, 511–512). This indicates that he probably could enjoy a rather ample diet throughout his life. (II)

The CT scans revealed that vicar Rungius was afflicted with DISH (II), which is often connected to the male sex and aging, but sometimes also to metabolic disturbances, such as type 2 diabetes and obesity. As a matter of fact, these are all interconnected, as abundant diet predisposes one to both (e.g. Forestier & Rotes-Querol 1950; Julkunen, Heinonen & Pyörälä 1971; Resnick & Niwayama 1976; Denko, Boja & Moskowitz 1994; Kiss et al. 2002; Musa et al. 2006; Manaster, May
As already mentioned, DISH has been linked to the typically rather protein and fat-rich diets of the early modern clergy and upper classes. (Waldron 1985; 2009, 75–76; Janssen & Maat 1999; Rogers & Waldron 2001; Jankauskas 2003; Verlaan, Oner & Maat 2007; Fornaciari et al. 2009; Giuffra et al. 2010; Núñez et al. 2013, 482–484). Despite Vicar Rungius being an elderly male, the manifestation of DISH is also in line with him being corpulent. Even the slight indications of OA in the medial compartments of his knees, and the calcified remains of arteries and veins in his legs possibly suggesting minor atherosclerosis may – again despite his age, which is a factor in both these conditions – point towards the same (II; Keys 1952; Anderson & Felson 1988). Additionally, cardiovascular problems and DISH are interconnected (Mader, Verlaan & Buskila 2013).

Interestingly, researchers have recognized an association between high $\delta^{15}N$ values and DISH. Müldner & Richards (2007) who reported higher $\delta^{15}N$ values among DISH individuals interpreted this observation as a possible indication of a diet rich in animal protein, which was probably the case for Vicar Rungius, too. Statistically significant differences in $\delta^{15}N$ values between DISH and non-DISH individuals were also reported in skeletal material from late medieval British sites (Spencer 2008, 243). Now, regarding the presence of DISH, it should be considered whether the high $\delta^{15}N$ levels could, instead of a high-protein diet, rather be due to metabolic processes of this aetiologically relatively poorly known condition. The well-established association between DISH, type II diabetes and overweight in modern patients may point towards such link. (V)

If the dense radiopaque objects embedded internally in the Vicar’s back are interpreted as nephroliths, they could even further substantiate the hypothesis of Vicar Rungius’s overweight condition. Kidney stones do sometimes occur in connection with obesity (Taylor et al. 2005), and DISH (Bruges-Armas et al. 2006; Mader et al. 2009). However, as mentioned, rather than considering these objects as manifestation of a disease, they may be consequences of rodent activity taking place in the church graves (Väre et al. 2014; Väre et al. 2016).

Moreover, the dental findings were consistent with the stable isotope results and what is known about the local contemporaneous diet (IV; V). The Vicar’s dentition was in overall good condition for an elderly individual. Only three cavities could be detected which supports the assumption of a low intake of carbohydrates, and hence, a proportionally higher intake of fats and proteins (II; IV). An acidic environment in the mouth is a requirement in the development of caries, which is strongly linked with consumption of simple carbohydrates, while proteins or fats
do not advance the condition. In fact, some protein-containing foods, one of them milk, may even hinder the processes related to the disease. (Lingström et al. 1993; Navia 1994; Hillson 1996, 278–279; Johansson 2002; Aimutis 2004)

As a matter of fact, the Vicar’s low consumption of sugars would not be surprising considering that the majority of sugary delicacies only started to become more available in Northern Finland as late as the 18th century. Even then, cane sugar was an imported luxury product, and thus not always available, or certainly not part of the everyday diet. Even if honey was used in food and drink preparation, the relative consumption of carbohydrate-rich dishes must have been rather low. (Mintz 1993, 264; Magnus 1976 [1555], 286–300.) One compelling piece of evidence for the lack of simple carbohydrates in the diet may be the fact that in the early 17th century, no sugary items were reserved even for a visitation by the King of Sweden to near-by Oulu (Fig. 2; Virkkunen 1919, 374–375; Tranberg 2011, 241; Vilkama, Kylli & Salmi 2016).

4.4 Limitations of the study

While discussing the health of Vicar Rungius, it is important to remember that the subject is actually dead. Thus, in a strict sense, connecting the term “health” to the study may be somewhat confusing. It is, however, his state of health prior to his death that this study aims to expose and elaborate upon. In other words, the disease processes affecting him at the time of death, as well as those that were perhaps no longer active, but had left their mark on his remains, are at the focus of interest.

In palaeopathological research, the actual cause of death is often elusive as many times the acute infections that leave no clear skeletal signs, and are not readily recognizable in the remains, were the ones to kill people. Although mummification of soft tissues increases the likelihood of a proper palaeopathological diagnosis, mainly the chronic conditions, traumas, and their after-states are visible in skeletal tissue, but may not have directly caused the death. Moreover, remains with indications of chronic infections as opposed to remains exhibiting no such signs cannot be directly interpreted to have belonged to a less healthy individual. A functional immune system causes the reactions seen in the skeleton, while individuals with poor immune response may have succumbed before such signs ever appeared. (Wood et al. 1992; Larsen 1999, 64; Roberts & Manchester 2010, 13–14; Aufderheide & Rodríguez-Martin 2011, 117–118)

The cause of death of Vicar Rungius could not be resolved. Yet some findings possibly related to overweight and tuberculosis were made, but examining how
common either of these conditions were among the Vicar’s contemporaries is challenging. The available data concerning the causes of death does not cover the early 17th century, but they can be examined from the mid-18th century onward. The causes of death, however, do not reveal all the conditions from which the parishioners suffered. For instance, overweight would hardly be listed even if it had been prevalent in Kemi.

On the other hand, tuberculosis is among the mid-18th-century causes of death in Kemi. The situation during the 18th century, however, may not be directly comparable to that in the early 17th century. The healing methods had not significantly improved. Yet, the prevalence of many conditions in the early 17th century is known to have been different from what it was in the late 18th century. For instance, increase in the incidence of TB was only witnessed from the late 18th century onwards (Ilmoni 1853, 588; Vuorinen 2002, 176), while during the 16th and 17th centuries, the epidemics of plague affected Finland, and probably even Vicar Rungius’s native Turku area several times. Although no longer relevant to Vicar Rungius or yet visible in the death records, at least the last (1710–1711) epidemic of plague also affected the Northern Ostrobothnian, and even the Kemi region. (Mäntylä 1971, 223; Engström 1994, 44–45; Vuorinen 2002, 117–118; Vuorinen 2010, 191, 194–195.)

Finally, perhaps most notably, the problem of correctly interpreting the early modern diagnoses is still worth a consideration. There is no way of knowing which conditions are, for example, hidden behind the deaths registered as old age or frailty. In any case, it is well-known that deaths by various infectious agents were common in the late 18th century. This is in a rather sharp contrast to the most common causes of death in present-day Finland. In 2014, nearly half (46.1%) of the mortalities (52,409 deaths) were caused by neoplasms and more than a third (37.3%) by circulatory system diseases, while also dementias (15.5%), accidents or violence (6.1%), and alcohol-related causes (3.5%) were relatively well represented (OSF 2015B). Similar distinctions would probably appear between the modern and the early 17th-century causes of death.

The issues to be considered in the study of the remains of Vicar Rungius also include his mature age. Some lesions and changes found in the scans may simply be age-related, and have no further implications, such as connections to more serious pathological entities.

What is more, the suppositions of abundant diet and overweight are not completely unproblematic, either. First of all, an alternative explanation for the generous belly may be the formation of gases during the putrefaction of the
intestines, which would have caused the abdomen to inflate. It typically begins to
swell within a week from death, and may continue to do so for at least another week
after which the active decay continues the process, and the gases are released
through tears in the skin (e.g. Ajmani 1998, 79). The almost completely absent
viscera and brain combined with the mummified skin would suggest that the Vicar
died during winter, but his corpse was not directly placed into cold conditions. It
was likely held unburied for some time when the decomposition, and subsequent
bloating began (see e.g. Prahow 2010, 170). The fact that in the past, priests and
other members of the elite were commonly given weeks, or even months long
death-watches (Regnard 1982 [1731], 108; Kuusisto 1929, 78; Paavola 1998, 155,
262) supports this. Such procedures may have provided the setting for internal
decomposition prior to the burial into the soft-tissue-preserving conditions found
beneath the church floor.

However, even if the appearance of the abdomen and the arm is, instead of
overweight, due to decomposition, it does not necessarily contradict the assumption
of the Vicar’s generous body size, which is supported by other findings. The
estimation method (Ruff et al. 2005) used in the study would not be helpful in this
regard as it is incapable of taking into account the variation in adipose and muscle
tissue. Perhaps better suited to estimate the actual body size could be the convex
hull method. It is based on the estimation of the position of the surfaces of the
cadaver, which are used to calculate the volume and, on the basis of the average
tissue densities and body masses (Brassey & Sellers 2014). This method is worth
considering for application to the remains on a later date in hopes of confirming
that the Vicar actually weighed considerably more than what is indicated by the
estimation utilized.

Moreover, the other research methods do pose some challenges and limitations
to the study. The resolution of the CT-images was somewhat rugged. Detailed
scrutiny of some of the minute features and smallest pathological changes such as
the incipient carious lesions or possible periosteal new bone growth on the pleural
surfaces of ribs, was impossible, while more traditional examination methods may
have enabled their detection. The latter sometimes occurs in connection with TB in
lungs (Waldron 2009, 117). Its presence could have further supported the Vicar’s
diagnosis, but as these lesions are not solely caused by TB, they would not have
proven its presence. Also, for instance, the age estimation was unsuccessful for the
same reason. The resolution would not allow for the detection of tinier details, such
as micro-porosity of the symphyseal surfaces, which would have been necessary in
estimating the age on the basis of morphological changes. Despite this, the overall
appearance of the pubic symphysis did not contradict the supposition that the remains were those of a male individual in his late sixties or early seventies.

There are also many problems in interpreting the stable isotope results, especially considering the small sample size used in this study. First of all, many different diet combinations could explain any certain set of values. However, the prior knowledge of the contemporaneous Northern Finnish diets may be used in setting limits to which foodstuffs were the most likely to lead to the values obtained. It is, however, also important to notice that some mummified individuals in the control population were infants whose values may have been affected by breastfeeding and weaning practices (Fogel, Tuross & Owsley 1989; Schurr 1997; Herring, Saunders & Katzenberg 1998; Katzenberg, Herring & Saunders 1996).

Furthermore, during the Vicar’s time, in the early 17th century, the significance of the cultivation of crops was locally still marginal, and the productivity of agriculture poor, although livestock played an important role in the subsistence economy. Dependency on the natural resources was probably even further emphasized, as at the time the Kemi region experienced several failures of crops during consecutive years. These local minor catastrophes are related to the broader climatic pattern causing mean temperatures to fall especially low during the century concerned. The significance of the cultivation of crops and vegetables – consumption of which brings the δ15N values down – clearly increased after the Vicar’s time. (e.g. Virrankoski 1973, 16, 204–205, 207, 317; Vahtola 1997a, 119, 128–130; Regnard 1982 [1731], 28, 107; Tranberg 2011; Vilkama, Kylli & Salmi 2016.) Thus, it is worth considering whether the time gap between Vicar Rungius, and the 18th to 19th-century control population could partially explain the difference in the δ15N values.

Moreover, the stable isotope analyses conducted using one full big toe nail from the Vicar only revealed the isotope composition of his diet for approximately the last six months to a year prior to his death. This period may not be completely representative of the Vicar’s normal life. He probably retired already during 1628, the year previous to his death (Oikelmus 1984 [1950], 63). This may be an indication of his failing health. As already suggested, his state of health may have affected his mobility, and even inflicted pain. This may consequently have had an effect on what he ate during his last months; in the earlier subchapter flesh and organs of young animals, which could elevate the δ15N value, were suggested.

However, high δ15N values do not only indicate a protein-rich diet, but can, indeed, also tell about disturbances in nutrition and health (Reitsema 2013). For instance, in animal tests, differences of 0.5–2.0‰ in δ15N values of several tissues
were found between nutritionally restrained individuals and their controls who had unlimited access to food (Hobson, Alisauskas & Clark 1993). Nutritional stress caused by long-term nausea has a similar elevating effect also in humans (Fuller et al. 2005). What is more, in a longitudinal study of hair keratin of anorexia survivors, an impoverishment of 0.5–2.0‰ in the nitrogen value was seen during the healing process from the undernourished state the condition had caused (Mekota et al. 2006; Hatch et al. 2006). Considering that the elderly Vicar was gravely ill for months prior to his demise, there is the possibility that the values of his nail keratin are actually indicative of a lack of appetite, rather than of an abundant diet before he succumbed.

Instead of simply effecting the dietary choices, or being caused by them, pathological conditions may directly alter the isotopic composition of tissues. As mentioned, DISH is linked to elevated $\delta^{15}N$ values (Müldner & Richards 2007; Spencer 2008, 243), while in liver cirrhosis they tend to be lower (Petzke et al. 2006). Thus, without epicrises, it is impossible to tell, what kind of conditions may have affected the values of each individual. Thus, interpreting the results correctly is challenging. This is true especially in the case of results maintained using the nail and hair keratin. They only offer a temporarily restricted look at the subjects’ diets right before their demise – which likely resulted from some pathological processes.

Unfortunately, an analysis of Vicar Rungius’s bone sample that could have painted a more holistic, long-term picture of his diet (Tykot 2006, 132, 138) proved unsuccessful (Arosén 2014). Yet more, the diet during his youth (Hyötyniemi 1953, 38) may have been different from the one he consumed in the North during his later life. This is relevant as in his native Southwestern Finland, the diet changed into an agriculture-based one, and thus was richer in carbohydrate much earlier (e.g. Vuorela 1999, 143, 149). An accurate picture of his early diet would require an analysis of his enamel or dentine. Their isotope composition is rather stable and changes very little after its formation during the dental development in childhood (Wright & Schwarcz 1999).
5 Conclusions

The legendary mummy of Vicar Rungius is undoubtedly an important part of the history of the Kemi region. It has a double role as an advocate of the Bible’s creed and a representative of the local identities. Even though this particular mummy is not the only, or even the best preserved one beneath old Finnish churches, the special attention it has received has turned it into a local monument, and essentially transformed it into public property representing continuity while simultaneously reminding its viewers of the transitory nature of earthly existence. Perhaps because of these aspects, it continues to be an important tourist attraction although the medieval church surrounding it also represents an interesting, rare and valuable piece of history. However, Vicar Rungius is for the large part responsible for the fame of this church. In this regard, he has never ceased to participate in taking care of his home church.

The question of the originality of the Vicar’s remains needed to be discussed once the CT imaging provided information of their preservation. The damages observed in the neck region led to suspicions of whether the head of the mummy is still attached, or even the original, and if the remains could have been enhanced. Ultimately, it could be established with relative certainty that the head and torso are still connected, and hence, probably belonged to the same person. However, the question remains of whether the mummy resting in the old church of Keminmaa actually belonged to Vicar Rungius (*c.1560, †1629). After all, his remains are far from being the only ones that have gone through a natural mummification process underneath the church. Nevertheless, as there are no strong indications contesting their originality, it is believable that the remains are those of Vicar Rungius.

There are some potential indications of tuberculous infection in the remains. The most convincing of these is the spinal lesion that was probably of infectious origin, and had caused the fourth and fifth thoracic vertebrae to collapse anteriorly, which is typical in skeletal tuberculosis (Pott’s spine). Other lesions that may imply TB involvement are the calcifications in his scrotum, mediastinum and breasts. However, in a differential diagnosis, TB is not the only possible explanation to any of these findings. For example, the breast lesions may represent gynaecomastia, and the spinal finding tentatively assumed to be a TB-induced Pott’s spine may also have been caused by some other pathogens. Without a pathogen DNA confirmation of TB infection, the question of whether Vicar Rungius had the disease cannot be answered conclusively. Nevertheless, no matter what had caused his spinal collapse lesion, it must have inflicted considerable discomfort.
Vicar Rungius may still be discussed as the first Northern Finnish TB patient to be identified. This is in spite of the fact that by the time of his tenure, cases of the disease must already have occurred in the region for centuries. For comparison, pathogen DNA of *MBTC* has been found in Neolithic context in Finland’s former motherland, neighbouring Sweden (Nuorala et al. 2004). However, the rise in the TB deaths in Finland was only seen in the end of the 18th century (Ilmoni 1853, 588; Vuorinen 2002, 176). Unfortunately, the situation of even the number of deaths caused by TB, let alone the prevalence of the primary TB infection in the early 17th century cannot be traced through documents. Furthermore, the skeletal material preserves poorly in the acidic Finnish soils, which causes gaps in the palaeopathological record.

The CT scans did not help in identifying any certain cause of death. Nevertheless, the lesions implying a possibility of TB were not the only pathological findings. This is hardly surprising considering that Vicar Rungius died approximately in his 70s. He did, indeed, show signs of ailments which were probably connected to, if not caused by, his mature age.

In addition to reaching comparative longevity among his contemporaries, Vicar Rungius was probably also rather large among them. He was tall, but some findings indicated that he was even overweight, suggesting either a relatively immobile lifestyle, hefty diet, or both. This feature is observable in external examination, but it is also associated with some of the conditions detected through the CT imaging. He was diagnosed with DISH, which is typically connected not only to mature age and male sex, but also to overweight, and even an abundant diet that is rich in proteins. Furthermore, the minor signs of OA in his knees and some calcifications in the leg veins and arteries may be connected to his age, but possibly also to his weight. What is more, he is not the only early modern clergyman with manifestations of DISH in his skeleton. The condition has, indeed, also previously been connected to a lifestyle typical of his rank.

The carbon and nitrogen stable isotope analyses performed using his nail keratin agree with the considerations of protein rich diet. This is indicated by his elevated nitrogen values. On the other hand, palaeopathologists have found such high values to be typical in DISH sufferers in osteoarchaeological settings. Nevertheless, the Vicar’s dental health does not give indications of a strong input of, for example, sugars in his diet. What is more, the local early 17th-century diet in Northern Finland was mainly based on food products derived from the rich local natural resources. The game, but particularly the yield of the aquatic environments – in Kemi, mainly salmon – and to a lesser extent – even seal, were essential, while
the role played by the cultivation of crops was still minor. Moreover, keeping livestock was regionally a very important source of livelihood.

According to the stable isotope analyses, the diets indicated by the nail and hair keratin of the other studied individuals also contained plenty of protein-rich foodstuffs. Although most of these individuals had likely lived somewhat later than the Vicar, at a time when the significance of cultivation was already increasing, the aquatic resources still played a key role in their nutrition. Nevertheless, as a vicar, Rungius definitely had a privileged access to a versatile and abundant diet. This was ensured by the lands and cattle of the vicarage, but also by the various tithes, and commissions for which he could charge extra. The rather ample diet he consumed during an era plagued by several serious crop failures must be explained by both his high social standing that may have been relevant in dictating what is suitable nutrition, and his ability to purchase the wanted food items. As a vicar, he was a highly respected character in his time. In this respect, he represented the top of the social ladder of his parish and enjoyed the various benefits that came with his rank. According to the stable isotope analyses, he also seemed to have been on the top of the local food chain (sic.).
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