

1 The Year of the Elephant

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8 Based on historical interpretations of the Sūrat al-Fīl, the 105th Meccan sura of the
9 Qur'an, an epidemic occurred near Mecca circa 570 C.E. (common era), the Year of the
10 Elephant in Islamic history. The five verses of the Sura are thought to be an allegorical
11 description of the “elephant war epidemic,” so named because invading Axumite
12 (Ethiopian) forces from present-day Yemen included one or more war elephants. The
13 elephants refused to enter the city, causing the Axumites to halt the attack. Interpreted
14 literally, divine intervention defeated the invaders by sending a flock of birds (*ababil*)
15 that dropped pellets—a possible allusion to pustules—onto the Axumites, maiming them,
16 and ending the siege of the city. Early historians described the signs and symptoms and
17 thought they were allegorical for either a smallpox or measles epidemic; available
18 descriptions favor smallpox. The residents of Mecca were spared. Descriptions of the
19 birds and use of the term *ababil* for birds are consistent with barn swallows (*Hirundo*
20 *rustica*, subspecies *transitiva*), which collect clay pellets to make nests. They are attracted
21 to flies following domestic animals. We consider the zoonotic origins, geographical

22 distributions and clinical presentations of two types of smallpox virus, and propose that
23 the epidemic was due to Variola major. Since the prophet Muhammad was born in 570
24 C.E., the events played a critical role in the birth of Islam.

25

26 **Introduction**

27 Smallpox has probably existed in the human population for thousands of years, but the
28 first reasonably clear descriptions appeared in documents in the 4th century C.E. by Ko
29 Hung in China and in the 7th century by Vagbhata in India (Fenner et al, 1988; Hopkins
30 1985). The most influential treatise, *al-Judari wa al-Hasbah* (On Smallpox and Measles),
31 was written by the renowned physician-scholar Muhammad ibn Zakariyā Rāzī, or Rhazes
32 (860–932 CE) at the beginning of the tenth century. He is credited with first clearly
33 distinguishing smallpox and measles, a diagnosis that continued to confuse Western
34 physicians until well into the second millennium (Amr and Tbakhi 2007, Fenner et al,
35 1988). The disease first entered the Arabian peninsula prior to 570 C.E., brought across
36 the Red Sea by the Christian Axumites (Ethiopians), who conquered the region of
37 present-day Yemen. In that year, *Āmu l-Fīl* or the Year of the Elephant, the Axumites
38 also invaded Mecca, but the attack was thwarted, an event described only in five verses or
39 ayats of the *Sūrat al-Fīl*, Sura 105 of the Qur'an. The Scottish physician-explorer James
40 Bruce found Ethiopian chronicles entitled *Siege of Mecca* that describe the defeat of the
41 Axumite army in which the author El Hamessy reckoned the Sura had to be a parable for
42 an epidemic disease, possibly the first description of a true smallpox epidemic (Fenner et
43 al, 1988; Bruce, 1804; Hopkins, 1985).

44 The so-called “elephant war epidemic” is an otherwise obscure event in a long history of
45 smallpox that was to follow. Others have described previous outbreaks in the
46 Mediterranean of what may have been smallpox; subsequent, well-documented epidemics
47 also occurred in the latter part of the first millennium that led to a spread throughout

Europe, North Africa, the Middle East, and Asia (Figure 1). Other writers through the centuries have interpreted the allegorical passage as a description of an epidemic disease—smallpox in particular, but the evidence for smallpox has been deemed “flimsy” as recently as 2004 (Glynn and Glynn, 2004) The event might remain a minor historical curiosity, except that it had an important historical implication—it took place in the same year that the Prophet Muhammad was born. The presumed outbreak occurred during a battle between an invading Axumite army and pre-Islamic Arabic tribes around the city of Mecca. We re-analyze the evidence relating to the cause of the presumed epidemic and its place in history.

Historical background

By the sixth century C.E., the Byzantine Empire included protectorates in Asia Minor, Syria, Egypt, Nubia, and Axum (parts of present day Ethiopia and Eritrea). Axum had converted to Christianity three hundred years before, and was in its ascendancy. The kingdom had an alliance with Emperor Justinian in Constantinople. A major rival to the Eastern Roman Empire was the Persian Empire under the Sassanid Dynasty. The Persians controlled vassal states along the western Arabian Sea, including most of what is now Yemen and Oman, but they were also sympathetic to the pre-Islamic tribes throughout Arabia. A small independent Jewish kingdom of Himyar (present-day Yemen) existed on the southwestern coast of the Arabian peninsula facing the African continent and Axum.

In 530 C.E., an Axumite army had previously attacked Himyar by crossing the Red Sea. Christian King Kaleb sent the army to conquer the Jewish kingdom that had committed pogroms against Christian minorities. Munro-Hay, citing the Byzantine historian

70 Procopius and Guillaume's translation of Ibn Ishaq's *Sirat Rasul Allah*, mentions that
71 large forces, as many as 70,000 men, were sent to attack Sana'a—the Himyarite capital—
72 and to subjugate other nearby cities (Munro-Hay, 1991; Guillaume, 2002). The Axumite
73 army was traditionally organized into *sarwe* (regiments), each with a provincial or tribal
74 name. Each regiment was led by a general commanding large numbers of spear-carrying
75 infantry, archers, camel cavalry, and water-corvéé support units (water bearers). Some
76 accounts also mention a contingent of up to 80 elephant-fighters. Kaleb ordered his
77 generals to conquer Himyar and to kill a third of its men and to lay waste to one-third of
78 the country, then seize one-third of its women and children (Guillaume, 2002). The attack
79 against Mecca, 40 years later, most likely involved a similar-sized army. The army was
80 lead by Abraha Al Ashram (Abraha the hare-lipped), a viceroy who had been overseeing
81 Himyar since the Axumite victory in 530. He was instructed to attack the city as revenge
82 for the defilement of a Christian shrine in Sana'a by Arab pagans incensed over a
83 previous insult to the Kaaba in Mecca. The time of year, duration of battle and strength of
84 his army are not known, but troop size and contingent forces were probably similar to the
85 earlier conquest of Himyar (The year is most often cited as 570 C.E., but estimates vary
86 by a few years). Mounted on an elephant, Abraha led his army overland through desert
87 terrain from Sana'a northwards to Mecca, some four hundred miles across arid land and
88 through mountain passes.

89 By the late sixth century Mecca had become an important trading center for merchants
90 who chose to avoid dangerous overland caravan routes between Europe, Egypt, India and
91 China. African ivory, Asian silk, locally produced frankincense and myrrh, and imported
92 spices were prized items of trade between the East and West. Mecca had established

communications and trade between Himyar to the south, and Gaza, Damascus, and Aleppo to the north. Mecca's population was primarily composed of the Quraysh tribe, which consisted of dozens of clans allied with nearby tribes living in the surrounding hills and mountains. There were also non-Arab craftsmen, merchants and visitors from the Byzantine Empire living in the city, but the size of this population is not known.

The term "elephant war epidemic" derives from an allegorical passage in the Qur'an referring to Abraha mounted on an elephant. Allah smote the enemy army with small "stones":

أَلَمْ تَرَ كَيْفَ فَعَلَ رَبُّكَ بِأَصْحَابِ الْفِيلِ
أَلَمْ يَجْعَلْ كَيْدَهُمْ فِي تَضْلِيلٍ
وَأَرْسَلَ عَلَيْهِمْ طَيْرًا أَبَابِيلَ
تَرْمِيهِمْ بِحِجَارَةٍ مِّن سِجِّيلٍ
فَجَعَلَهُمْ كَعَصْفٍ مَّأْكُولٍ

Have you not considered, how your Lord dealt with the companions of the elephant? Did He not make their plan into misguidance? And He sent against them birds in flocks, Striking them with stones of hard clay, And He made them like eaten straw.

Qur'an 105:1-5

Flocks of birds flew overhead, dropping clay pebbles on the enemy and crushing them. Some have suggested the pebbles may refer to the lesions of measles. Spelling of the two words are different but pronunciation is similar in present-day Arabic (Table 1).

The distinction between the two diseases awaited Rhazes' description a few hundred years later. The two diseases are easily conflated since both cause a skin eruption. Ibn Ishaq, referring to another historian, states "Utba told me that he was informed that year was the first time that measles and smallpox had been seen in Arabia; and too, that it was the first time that bitter herbs like rue, colocynth and *Asclepias gigantea* were seen." (Guillaume, 2002). (Mention of these botanicals indicates trade existed from countries where smallpox may have been brought to the southwestern Arabian peninsula; the herbs are native to Eastern Europe, the Mediterranean basin and Iran, which suggest that they had been recent importations from these regions.) One of the earliest historical descriptions was by the Roman Eusebius in 302 C.E.:

"It was characterized by a dangerous eruption which unlike the true plague spread over the whole body and which often affected the eyes and resulted in the loss of sight, which had a profound effect of protecting against a second attack of the same disorder, and whose eruptions were accompanied by a very offensive smell", which Willan concluded were due to the confluent form of smallpox (Willan, 1821).

Descriptions specific to a differential diagnosis, clinical signs, complications, immunity, and mortality estimates specific to the elephant war epidemic (detailed in Table 2) include:

... as they brought him (Abraha) along the retreat, his limbs fell off piece by piece, and as often as a piece fell off, matter and blood came off." (Dixon, 1962)

"... as they withdrew they were continually falling by the wayside dying miserably by every watering hole. Abraha was smitten in his body, and as they took him away, his

137 fingers fell off one by one. Where the fingers had been, there arose an evil sore exuding
138 pus and blood, so that when they brought him to Sana'a, he was like a young fledgling."
139 (Guillaume, 2002).

140 The metaphor "like eaten straw" has been interpreted as referring to stubble remaining in
141 a barren field, or broken blades seen in animal dung—both interpretations implying
142 useless, decaying and fetid remains. This image reinforces the previous descriptions of
143 death and dying. The only citation suggesting the size of the army and extent of its
144 devastation comes from a poem listed in Ibn Ishaq's narrative:

145 "He who knows what happened will tell the ignorant. Sixty-thousand men returned not
146 home. Nor did their sick recover after their return." (Guillaume, 2002)

147 Muslim commentary on the Surah is included in the Tafseer-a-Kabeer, a 10-volume
148 exegesis on the Qu'ran by Mirza Mahmood Ahmad written in the 20th century. In the
149 English translation, the author also seems to have taken the verses as allegorical (possibly
150 from previous commentary). He states that Abraha's camp was overtaken by smallpox
151 with no mention of the allusion to swarms of birds mentioned in the Surah other than:
152 "Swarms of birds feasted themselves upon dead bodies of the invaders, striking the
153 severed pieces against stones, as birds generally do when eating the small and severed
154 pieces of the dead body of an animal."

155 **Discussion**

156 Smallpox is caused by the variola virus. Based on its DNA, scientists propose that the
157 virus may have originated from the camel pox virus sometime in the remote past (Gubser

and Smith, 2002) Alternatively, studies of hundreds of smallpox isolates support a rodent-borne original source (Li et al, 2007) Two separate smallpox viruses have distinct geographical origins and different fatality rates. Alastrim minor may have originated in West Africa 18,000-70,000 years ago and has a one percent mortality rate. *Variola major*, which may have originated in East Asia 400-1600 B.C.E., (Fenner et al, 1988) has a 20-50 percent mortality rate in an unvaccinated population (Heymann, 2008). Descriptions from ancient and classical literature suggest that the latter, more virulent type, probably spread from Central Asia through migratory and trade routes into the Middle East and Mediterranean basin around 1000 B.C.E. (Figure 1). Alastrim appears to have been confined to its west African origin until very recently and was not involved in early Middle Eastern epidemics. (All future references to smallpox refer to *variola major*.) Hopkins has proposed that *Variola major* may have been responsible for the failed invasion by Carthage on Sicily (395 B.C.E.), and the later success of Rome during the Punic Wars (262-146 B.C.E.) (2). It may have been responsible for other early Middle Eastern outbreaks, including the early Syrian epidemic mentioned by Willan.

Independent of its animal origin, ultimate source, and geographical spread, smallpox had become an endemic disease throughout the Old World by the first few centuries of the common era. It may have been introduced many times from Asia into eastern European, and Middle Eastern regions, becoming focal. Lack of sufficiently large and densely populated communities may have limited large epidemics since most people were living in isolated villages or traveling by small nomadic tribes. The potential to cause major epidemics may have required larger non-immune communities where its introduction would allow for rapid spread. Hopkins noted that by the time of Roman ascendancy there

181 were seven million people living in the Nile valley, 58 million in China, and 25 million in
182 India, many living in cities. Communication among these regions was well established by
183 the sixth century by Middle Eastern-Asian caravan routes, and by ocean voyages through
184 the Red and Arabian Seas to and from India and the Far East. The prerequisites for major
185 epidemics—large, concentrated non-immune populations and introduction of the virus by
186 peoples via land and sea—were in place by the time of the Roman Empire (perhaps even
187 earlier) and certainly were present in the latter part of the first millennium.

188 The unique physical stigmata of smallpox (purulent lesions and pitted pockmarks) have
189 allowed historians to deduce its presence from ancient Chinese writings and Egyptian
190 papyri. Chinese and Indian physicians recognized that inoculation using scabs produced
191 immunity to the disease. Microscopic analysis of mummified skin scrapings support the
192 theory that Ramses V died of the disease in 1157 B.C.E. (Hopkins) but early physical
193 descriptions may not have been associated with epidemics—or at least this is not
194 recorded. Classical works of Hippocrates (c. 460-370 B.C.E.) and other ancient Greek
195 and Roman scholars do not describe these lesions or epidemics. In the second century
196 C.E. Galen may have referred to its physical presentation, but although his description
197 may have been of smallpox, it does not appear to be associated with a major outbreak.

198 Before the germ theory the cause of a disease was based on its physical signs (viz. bubos
199 of plague). Diseases producing a rash (smallpox, measles, typhus) were often conflated
200 with each other. Ancient DNA may be recovered from victims, but it cannot answer the
201 question whether they died of a disease or with it. Retrospective diagnoses of epidemics
202 are often impossible when distinctive signs are not described, but circumstantial evidence
203 often points to a probable cause. Historical references and oral traditions about the

204 circumstances surrounding the Mecca epidemic suggest a deadly disease of some sort did
205 occur, but are not sufficient to differentiate between smallpox and measles.

206 The first clear differentiation between smallpox and measles by Rhazes (nearly three
207 centuries after the birth of Muhammad), though not directly related to the interpretation
208 of Sura 105, might seem an oversight if not mentioned. Rhazes wrote copiously on many
209 subjects, primarily medicine. Rhazes is one of the most revered figures of the Islamic
210 Golden Age, considered a genius of medieval medicine. According to Rhazes "Smallpox
211 appears when blood 'boils' and is infected, resulting in vapours being expelled. Thus
212 juvenile blood (which looks like wet extracts appearing on the skin) is being transformed
213 into richer blood, having the color of mature wine. At this stage, smallpox shows up
214 essentially as 'bubbles found in wine' - (as blisters) - ... this disease can also occur at other
215 times - (not only during childhood) -. The best thing to do during this first stage is to keep
216 away from it, otherwise this disease might turn into an epidemic." Although Rhazes
217 remarked on the writings of Galen and other early discourses on diseases that probably
218 included smallpox, (Willan, 1821) to our knowledge he never mentioned the elephant war
219 or Sura 105 in his writings. He was among several scholars of the Golden Age known as
220 Faylasufs (the term a referent to Greek philosophy), who stressed rational argument and
221 free thinking. (Hecht, 2004; Deuraseh, 2008) Many of his original works on philosophy
222 and other subjects are missing, but the Muslim writer Deuraseh and others left evidence
223 of their existence: "Religiously, he did not reduce the harshness (qasawah) by his neglect,
224 avoidance, or ignorance since he worked on disapproved things with evil desires and
225 corrupt deeds. In addition, he was influenced by the books of Mani and his followers
226 which deceived all religions...The proof of what I say can be found at the end of his book

227 On Prophecies.” (Deuraseh, 2009) Rhazes had an interest in mythology and interpretation
228 of allegory, but never mentions the Sura or any interpretation related to smallpox and
229 measles.

230 The Sura refers to the flocks of birds as *ababil*. Some descriptions of the birds include a
231 leonine appearance, although this is clearly a legendary embellishment. Other early
232 accounts mention the *ababil* as having black and green coloring with white and yellow
233 beaks. “Ababil” is a Middle Eastern term that can apply to the common barn swallow
234 (*Hirundo rustica*, subspecies *transitiva*)—which has similar markings mentioned above,
235 with dark orange throat feathering. Barn swallows are found throughout the world,
236 including Arabia (Turner, 1989). Large flocks consisting of over 100,000 birds have been
237 documented by ornithologists. Millions of Eastern European barn swallows migrate to
238 and from South Africa every fall and spring of the year, passing through the Arabian
239 peninsula. Although they are not known to carry objects in their talons, both males and
240 females collect mud and grass in their beaks to create cobbled, cup-like nests composed
241 of hundreds of clay pellets. Nests are built in the eaves of buildings, manmade and natural
242 overhangs, and in cave entrances. Swarms of these insectivorous birds are attracted to
243 animal herds that produce manure, drawing flies; moving herds disturb resting flies,
244 making them easily caught on the wing. These swallows would have favored the friendly
245 environment around Mecca both before and during the siege, providing them with
246 harborage, nesting materials, and flies attracted to the manure of local sheep, cattle, goats,
247 camels, and Abraha’s animal retinue.

248 The elephant that Abraha rode was probably the North African elephant (*Loxodonta*
249 *africana pharaoensis*)--now extinct, which had been used by the Carthaginians centuries

250 before. Its original range extended across North Africa and down the grasslands of the
251 Sudan. Some have questioned the claim that elephants could not survive a long cross-
252 desert sojourn because of their need for water. However, according to the parable, Abraha
253 may have brought only a single elephant with him. His water bearers, oases, and wells
254 along the northern march would have provided sufficient water for both the large army
255 and its animal retinue, including at least one, but many elephants, and hundreds of horses,
256 camels, and beasts of burden.

257 The various tribes living in and around Mecca had traded with many Middle Eastern
258 countries for centuries, which in turn had contact with populations further east. If Willan
259 is correct about an earlier Syrian epidemic, the disease may have spread along trade
260 routes from the interior of Asia to the southeastern coast of the Mediterranean, thence to
261 the eastern coast of the Red Sea, becoming endemic in Arabian pre-Islamic populations,
262 including the tribes in and around Mecca.

263 Historians are not able to conclude which disease felled the Axumite army. Smallpox
264 complications include blindness, hemorrhages and permanent pockmark scarring.
265 Measles does not typically produce pustular lesions or scarring, although blindness may
266 be a complication. Whether the epidemic was due to smallpox or measles is largely moot,
267 since either disease can produce serious illness and death. Some suggest that the infection
268 was brought with the Axumites from Himyar. With the exception of its connection to its
269 African homeland, Sana'a and the other Himyarite cities were largely isolated; they did
270 not interact with their Persian adversaries along the eastern portion of the Arabic
271 peninsula. Since its occupation of Himyar 40 years before, two generations of Axumites
272 had been born in its cities. If smallpox (or measles) had been present there (or in Axum),

exposure should have provided some sort of immunity, but its soldiers may have been immunologically naive for both diseases.

Conclusions

It is evident that an epidemic of some sort—smallpox or measles—crippled the Axumites during the siege of Mecca in 570. Fragmentary evidence supports smallpox. Subsequent larger outbreaks in North Africa and the Mediterranean littoral region were definitely smallpox. The Mecca outbreak was minor in comparison to later epidemics, but was historically important. Had the Axumites succeeded in conquering Mecca in 570, they would have instituted measures similar to those inflicted on Himyar four decades before—killing women, razing crops and enslaving its captives. In that same year an infant was born—the future Prophet Muhammad (peace be upon him). The child and His mother may have been killed or enslaved. In the Bible it states that Yahweh divinely intervened to help His people in Egypt by inflicting ten plagues on the Egyptians. In the Qur'an, Allah divinely intervened to save His future Prophet with a single plague.

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 332 new ed.; and detached papers on medical subjects, collected from various periodicals
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334 Table 1. English and Arabic terms related to portions of Sura 105 (in modern day
335 Arabic)..

English	Arabic
Smallpox	جدري
Pebbles	الحصى
Measles	حصبة

336 From Google Translate (<http://translate.google.com>).

337

338 Table 2. Differential diagnoses, clinical presentations, complications, immunity, and
339 mortality estimates of the elephant war epidemic.

340 _____

Sign/symptom	Smallpox	Measles	Reference
Eruption over entire body	++++	++++	1
Pebble-like skin lesions	++++	++	3
Bloody lesions	++++	+	5
Pustular lesions	++++	+	1
Offensive smell	+++	+	1
Blindness	+++	++	3 ,1
Permanent immunity	++++	++++	8 ,4 ,3
Mortality	++++	++	4 ,3
Mortality range	20-50%	10-30%	8

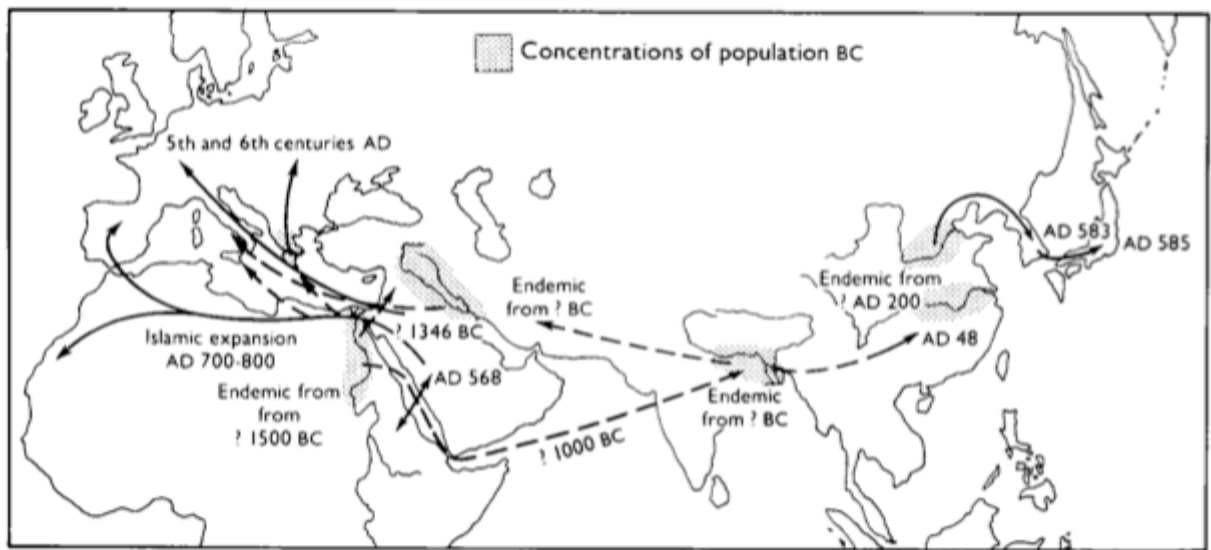


Figure 1. Possible early sites of outbreaks and routes of spread of smallpox in the ancient world (Reproduced from the World Health Organization (Fenner et al, 1988).