The Diseases of the Indo-European Peoples

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What do we understand with the term *disease*?

- **Disease**: (human) infectious, viral, and bacterial diseases
- **Conditions/human difficulties**: psoriasis, obesity, rickets, arthritis ...

*Miasmatic theory* of disease: obsolete medical theory from Greek *miasma* ‘pollution, bad air’
Ch. P. Andam et al., *Microbial Genomics of Ancient Plagues and Outbreaks*
*Trends in Microbiology*, Dec. 2016 vol. 24, No. 12, p. 979
leprosy

- **Gk. ἀλφός/alphós** ‘dull-white leprosy’ (non contagious), cf. Gk. λέψη ‘leprosy’
- **Gk. κελεφός** (ix, gloss.) semitic loanword, see Syrian qǝlāfā ‘cortex, squama, putamen’, qǝlāfānā ‘lepra’

- **Skt. da(r)dṛu** ‘leprosy’, cf. OE teter ‘tetter’, OHG zitaroh ‘id.’ (PGm. *tetru-*)
  - (Goth. gund ‘gangrene’, OE/OHG gund ‘pus’ (PGm. *gunda- ‘pus, decaying skin’): Gk. κηνθύλη ‘abscess, tumor’)

- **Av. paēsa** ‘leprosy’
- **Skt. puru-pēsā** ‘lepros’
  maybe connected with Skt. pimšāti ‘to cut, carve’, Lat. pingō ‘to stich with a needle, paint’

- **Gk. λέπρα**, cf. Lat. leprosia

- **OIr. clamh, leprosus, sámthrosoc, bolgach, lobhar, clamtrusca**

- **Arm. bor-ot** ‘leprosy’ and later **bor** ‘leprosy’
  *‘brown animal’, ‘spotted’ > leprosy loan from Iran. *bor *leprosy?*
  only preserved in Sogd. /βr‘wk’ |βarūka| ‘leprosy’
  Maybe related to *bor* ‘spotted’

- **Arm. uruk** ‘lepros’
  Iran. *vorūk- through an intermediary *wuruk

- **Arm. pisak** ‘spotted, lepros’, cf. Pers. pīs ‘lepros, dirty’

- **SCR. gūba** ‘mushroom, tree-fungus, amadou, leprosy, snout, *gōba *tree-fungus’

- **SCR. krăsta** ‘scab(s), leprosy’
Ancient DNA study reveals HLA susceptibility locus for leprosy in medieval Europeans

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Fig. 1 Origin of medieval samples. Geographic location of the medieval cemeteries in southern Denmark and northern Germany from where the specimens in this study were obtained. Dates in parentheses indicate the time span of active use as cemeteries. Red dot marks the cemetery with LL-positive samples. LL: lepromatous leprosy. The software CorelDRAW was used to create the map (designed by B.K.-K.)
Ancient genomes reveal a high diversity of *Mycobacterium leprae* in medieval Europe


PLOS Pathogens | [https://doi.org/10.1371/journal.ppat.1006997](https://doi.org/10.1371/journal.ppat.1006997) | May 10, 2018

Fig 1. Worldwide distribution of the ancient and modern *M. leprae* strains analyzed in this study. Skulls represent strains from osteological specimens dated to the Medieval Period. Human silhouettes represent modern strains, sized to scale according to the number of samples, ranging from 1 (e.g. India) to 36 (South America). Animal silhouettes represent strains from the red squirrel, the nine-banded armadillo, and naturally infected nonhuman primates (a chimpanzee from Sierra Leone, a sooty mangabey from West Africa, and a cynomolgus macaque from the Philippines). Skulls outlined in black are the new *M. leprae* genomes reconstructed in this study, while skulls outlined in blue represent previously sequenced ancient genomes. Grey skulls are leprosy samples from this study that did not yield sufficient sequence for whole-genome analysis. The main *M. leprae* lineages, represented by branches (see Fig 2) are color-coded.

Gk. ἰλεός ‘(epidemic icterus’ (Hipp.), ἡπατιτις *‘belonging to the liver’, ‘hepatitis’ (‘dysentery’ Gal.18.1.145)

Toch. tute (adj.) ‘yellow’, tucepì yetsentse ‘for [cases of] jaundice’
halimak ‘jaundice’
kamāl ‘id.’

Hittite
ḫāḫḫallieške/a- ‘to become green/yellow’, ḫaḫlimma- ‘jaundice’ (OS)
see (GIŠ) ḫāḫhall- ‘greenery, verdure’

Arm. dalunkn
see dalar ‘green, fresh’
Ancient hepatitis B viruses from the Bronze Age to the Medieval period

**OIr. bléfed** ‘bubonic plague’

**Gk. λοξύς** ‘plague (deadly epidemic)’, *lai-mó- ‘polluting substances’

**Lat. pestis** ‘pest, death, pestilence’ (Pl.) < *per-(k)sitis ‘very thirst(y)’ (WH 296)?

**OCS morъ, Ru. mor** ‘death, plague’ (PSlav. *morъ)

**Lith. māras** ‘plague, death’ (*-stem derivative of mīštī, cf. Letv. mīšt ‘die’) (EDB² 305, LEW² 409) (PBalto-Slav. *moros)

IE *mor-o- ‘death’ to *mer- ‘to disappear, die’ (LIV² 439), cf. Ved. pra’mará- m. ‘death’ (RV+) to MAR ‘to die’ (EWAia II 318)

**Hit. ḥenkan** ‘death, deadly disease, plague’ (*-stem; OH/MH/NH)

**OCS morъ, Ru. mor** ‘death, plague’ (PSlav. *morъ)

**Lith. māras** ‘plague, death’ (*-stem derivative of mīštī, cf. Letv. mīšt ‘die’) (EDB² 305, LEW² 409) (PBalto-Slav. *moros)

IE *mor-o- ‘death’ to *mer- ‘to disappear, die’ (LIV² 439), cf. Ved. pra’mará- m. ‘death’ (RV+) to MAR ‘to die’ (EWAia II 318)

Possible IE cognates:

Goth. niēþ (nt.) ‘ill-will, envy’, Oeng. nīþ (nt.) ‘enmity, hate, combat’, OHG nīd(h) ‘enmity, hate, combative fury, etc.’ (Pgerm. *nīþa-)

Oir. nīth (gen. nitho) ‘combat, combative fury’ (< *nītu-), Welsh nwyd ‘passion’

**Toch. B ȵytse(E-C) ~ ȵtse(C-L)** ‘danger; plague, distress’

**Toch. A ȵtse** (borrowing from Toch. A, Adams 2013: 291)

**Hit. ḥenkan** forms *-enK- > -inK-: ḥenkan- → ḥiŋkan-
Our perception of the evolutionary history of *Y. pestis* was changed substantially by a recent report of two reconstructed genomes from Bronze Age individuals found in the Altai region (Southern Siberia, dating to ~4,729 cal BP and ~3,635 cal BP, respectively) and molecular *Y. pestis* signatures in an additional five individuals from Eurasia (~4,500 to 2,800 BP) suggesting the presence of plague in human populations over a diffuse geographic range prior to the first historically recorded pandemics.
Early Divergent Strains of *Yersinia pestis* in Eurasia 5,000 Years Ago

Simon Rasmussen,1,18 Morten Erik Allentoft,2,18 Kasper Nielsen,1 Ludovic Orlando,2 Martin Sikora,2 Karl-Göran Sjögren,3 Anders Gorm Pedersen,1 Mikkel Schubert,2 Alex Van Dam,1 Christian Molin Outzen Kapel,4 Henrik Bjorn Nielsen,1 Soren Brunak,1,5 Pavel Avetisyan,6 Andrey Epimakhov,7 Mikhail Viktorovich Khalyapin,8 Artak Gnuni,9 Aivar Kruiska,10 Irena Lasak,11 Mait Metspalu,12 Vyacheslav Moiseyev,13 Andrei Gromov,13 Dalia Pokutta,2 Lehti Saag,12 Liivi Varul,10 Levon Yepiskoposyan,14 Thomas Sicheritz-Pontén,1 Robert A. Foley,15 Marta Mirazón Lahr,16 Rasmus Nielsen,16 Kristian Kristiansen,16 and Eske Willerslev2,17,*

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*Yersinia pestis* was common across Eurasia in the Bronze Age

The most recent common ancestor of all *Y. pestis* was 5,783 years ago.

The ymt gene was acquired before 951 cal BC, giving rise to transmission via fleas.

Bronze Age *Y. pestis* was not capable of causing bubonic plague.
Analysis of 3800-year-old *Yersinia pestis* genomes suggests Bronze Age origin for bubonic plague

Y. P. caused diseases prior to the first attested pandemic

The origin of *Yersinia pestis* and the early stages of its evolution are fundamental subjects of investigation given its high virulence and mortality that resulted from past pandemics. Although the earliest evidence of *Y. pestis* infections in humans has been identified in Late Neolithic/Bronze Age Eurasia (LNBA 5000–3500y BP), these strains lack key genetic components required for flea adaptation, thus making their mode of transmission and disease presentation in humans unclear. Here, we reconstruct ancient *Y. pestis* genomes from individuals associated with the Late Bronze Age period (~3800 BP) in the Samara region of modern-day Russia. We show clear distinctions between our new strains and the LNBA lineage, and suggest that the full ability for flea-mediated transmission causing bubonic plague evolved more than 1000 years earlier than previously suggested. Finally, we propose that several *Y. pestis* lineages were established during the Bronze Age, some of which persist to the present day.
The Stone Age Plague: 1000 years of Persistence in Eurasia

Aida Andrades Valtueña1, Alissa Mittnik1,2, Felix M. Key1, Wolfgang Haak1,3, Raili Almæ1,4, Andrej Belinskij5, Mantas Daubaras5, Michal Feldman1,2 Rimantas Jankauskas5, Ivor Janković8,9, Ken Massy10,11, Mario Novak12, Saskia Pfrengle2, Sabine Reinhold12, Mario Šlaus13, Maria A. Spyrou1,2, Anna Szecsenyi-Nagy14, Mari Törv15, Svend Hansen12, Kirsten I. Bos1,2, Philipp W. Stockhammer1,19, Alexander Herbig1,2* and Johannes Krause1,2*

- six new *Y. pestis* genomes spanning from the European Late Neolithic to the Bronze Age (LNBA) dating from 4,800 to 3,700 BP

- *Y. pestis* may have entered Europe from Central Eurasia during an expansion of steppe people, persisted within Europe until the mid Bronze Age, and moved back towards Central Eurasia in parallel with subsequent human population movements.

- six novel *Y. pestis* genomes from Central Europe and the North Caucasus steppe spanning from the Late Neolithic to the Bronze Age.

- all LNBA strains form a single clade in the *Y. pestis* phylogeny: a common origin of all currently identified *Y. pestis* strains circulating in Eurasia during the Late Neolithic and Bronze Age

- multiple strains circulating in Europe and Asia?
Afanasievo culture, Altai, Siberia (2782 cal. BC)

Corded Ware culture, Estonia (2462 cal. BC)

Únětice culture in Poland (2029 cal. BC)

Iron Age: Armenia (951 cal. BC)

Andronovo culture in Altai, Siberia (1686 cal. BC)
The Plague
And then, when he had gone apart, the old man prayed earnestly to the lord Apollo, whom fair-haired Leto bore: “Hear me, you of the silver bow, who have under your protection Chryse and sacred Cilla, and who rule mightily over Tenedos, Smintheus, if ever I roofed over a pleasing shrine for you, or if ever I burned to you fat thigh pieces of bulls or goats, fulfill for me this wish: let the Danaans pay for my tears by your arrows.”

So he spoke in prayer, and Phoebus Apollo heard him. Down from the peaks of Olympus he strode, angry at heart, with his bow and covered quiver on his shoulders. The arrows rattled on the shoulders of the angry god as he moved; and his coming was like the night. Then he sat down apart from the ships and let fly an arrow; terrible was the twang of the silver bow. The mules he attacked first and the swift dogs, but then on the men themselves he let fly his stinging arrows, and struck; and ever did the pyres of the dead burn thick (A. T. Murray)
7. Not the great one among us nor the wee little one, not the growing one among us nor the grown—don't smite our father nor our mother. Don't harm our own dear bodies, *Rudra*.

8. Don't do harm to our progeny and posterity nor to our (own) lifespan, **not to our cows nor to our horses**. Don't smite our heroes, Rudra, when enraged. We, with our oblations, will always invoke you.

10. **In the distance be your cow-smiting and men-smiting** (anger). You who rule over heroes, let your favor be on us.
Apollo

Rudra

AVŚ 11.2.1

bhávāśarvau mṛḍātaṁ mābhī yātaṁ bhūtapatī pāśupatī námo vām prátihitām áyatāṁ má ví srāṣṭam má no hiṃsiṣṭaṁ dvipádo má cátuspadaḥ

‘O Bhava-and-Çarva, be gracious; do not go against (us); ye lords of beings, lords of cattle, homage to you! (the arrow) that is fitted, that is drawn, do not let fly; do not harm our bipeds nor quadrupeds’
‘(The gods have protected Hurma), but they shot/hurled the plague at the Hurrian (and the Hurrian army began to die)’

§1
1 [d]IM URUḫatti BELI-YA [ ... BEL] UMES-YA [...]

4 ki=wa kwit iyatten
5 nu=wa=kan INA ŠÅ-BI KUR URUḫatti ḫinkan tarnatten
6 nu=wa KUR URUḫatti ḫinganaz arumma mekki tamaštat
7 nu=wa PANABI-YA PAN ŠEŠ-YA akkišketat

10 kāš MU₂₀ KAM
11 kwit=kan INA ŠÅ KUR URUḫatti akkiškettari
12 nu=kan IŠTU KUR URUḫatti ḫinkan [a]rḫa UL=pat taruptari

§5 [...]  
64 nu LÜMES appa[ndan] kwin ēpper
65 n=an mahḥan INA KUR URUḫatti EGIR-pa uwatēr
66 nu=kan INA ŠÅ-BI LÜMESŠU.DAB.BIḪA ḫinkan kišat
67 n=as[a]k[kiškewan d][āiš]

§6
70 nu=kan INA ŠÅ KURḫatti apēzz(a) UD KAM ḫinkan akkiškettari

§6
70 Seit jenem Tag wird im Inneren des Landes Ḫatti gestorben.
(Rieken et al. Hethitologie Portal, Mainz)
Apollo

Rudra

Rešep
Syrian god; God of War, Thunder and Pestilence
Rešep
Syrian god; God of War, Thunder and Pestilence

prayer of Anat to Baʿal to keep the arrows of Rešep away:

KTU 1.82.3-4 [yš]b*/d*t. b’l. ḥz. ršp/bn*. km. yr. klyth. wblh
May Baʿal take away the arrow of Rešep when R. shoots his arrow at his kidneys and at his heart (de Moor/Spronk 1984:24, Niehr 2003:87)

Cf. Ugar. ršp ḫṣ ‘Rešep Lord of the Arrow’, cf. ršp ḫgb ‘R. the gatekeeper’, ršp ṣḥ ‘R. of the army’

Rešep as healer:
KTU 1.123.30-32 šlm il ḫšm / ršp inš i[lm] / drm īlm
Hail, god of the tomb / Rešep, of the deified ancestors / the families of gods
Rudra

AV 6.90
1 yám te rudrá iṣum ásyad áṅgebhyo ḫṛdayāya ca idám tám adýá tvád vayáṃ vísūciṃ ví vṛhāmasi
2 yás te śatāṃ dhamánayó ‘ṅány ánu viṣhtitah táśaṁ te sārvásāṃ vayáṃ nír viṣáṇi hvāyāmasi

1. The arrow that Rudra hurled at thee, at thy limbs and heart, that do we now thus eject asunder from thee.
2. The hundred tubes that are thine, distributed along thy limbs, of all these of thine do we call out the poisons

Rešep

Syrian god; God of War, Thunder and Pestilence

prayer of Anat to Baʿal to keep the arrows of Rešep away:
KTU 1.82,3-4 [yš]b*/d*t. b’l. ḫz. ršp/bn*. km. yr. klyth. wbh
May Ba’al take away the arrow of Rešep when R. shoots his arrow at his kidneys and at his heart (de Moor/Spronk 1984:24, Niehr 2003:87)
Cf. Ugar. ršp ḫṣ ‘Rešep Lord of the Arrow’, cf. ršp ḫgb ‘R. the gatekeeper’, ršp ṣḥ ‘R. of the army’

Rešep as healer:
KTU 1.123,30-32 šlm il ḫśm / ršp inš i[lm] / drm ilm
The deified ancestors / the families of gods

RV 2.33.2
tvádattebhī rud, ra śámtamebhīḥ śatāṃ híma aśiya bhesajébhīḥ
vṛ y àsmaḍ dvéso vitarāṁ vṛ y ámbho vṛ y āmivā śatayasvā vísūciḥ
2. Through the remedies given by you that bring best luck, Rudra, might I reach a hundred winters.
Banish hatred away from us, very far away, distress away, and afflictions away, widely scattered.

4cd ūn no viṛāṇi arpayā bhesajébhīḥ bhiṣáktamaṃ tvā bhiṣājāṃ śṛṇomi
Set up our heroes with your remedies: I hear that you are the best healer of healers.
Apollo

Rudra

Maruts

Rešep
Syrian god; God of War, Thunder and Pestilence
Maruts: the archers of the sky

RV 1.64.10cd (Indra)

“... and the superior men of endless tempests and bullish bangles..."

IId [...] *marúto bhrájadr̥ṣṭayāḥ* ‘ [...] the Maruts with their *glistening spears’

**How are their arrows?**

RV 8.20.11

“...(Maruts) Common to them (all) is their unguent; their *brilliants* glint on their arms. Their *spears* keep *flashing.*”

RV 1.172.2

“In the distance be *your* straight-aiming *arrow*, you Maruts rich in drops, in the distance the stone that you hurl.”
Arrows are... bright – feathered - swift

RV 1.148.4cd
"after that the wind fans his flame, like an arrow, the shot of a shooter, through the days.

RV 6.46.11
“So then, as ever, be there to strengthen us. Indra, help our leader in the fight, when the feathered, sharp-headed arrows fly in the midspace”

RV 8.77.7
“Your arrow with a hundred ruddy glints and a thousand feathers was the single one that you made into your yokemate, o Indra.”

RV 1.66.7 (Agni)
“Set loose like an army, he initiates an onslaught, like the arrow of an archer with its dazzling point.”

RV 7.46.1ab
“Bring these songs to Rudra, whose bow is taut and whose arrow is swift”
And then, when he had gone apart, the old man prayed earnestly to the lord Apollo, whom fair-haired Leto bore: “Hear me, you of the **silver bow**, who have under your protection Chryse and sacred Cilla, and who rule mightily over Tenedos, Smintheus, if ever I roofed over a pleasing shrine for you, or if ever I burned to you fat thigh pieces of bulls or goats, fulfill for me this wish: let the Danaans pay for my tears by your arrows.” So he spoke in prayer, and Phoebus Apollo heard him. Down from the peaks of Olympus he strode, angry at heart, with his bow and covered quiver on his shoulders. The arrows rattled on the shoulders of the angry god as he moved; and his coming was like the night. Then he sat down apart from the ships and **let fly an arrow**; terrible was the twang of the silver bow. The mules he attacked first and the swift dogs, but then on the men themselves he let fly his **stinging arrows**, and struck; and ever did the pyres of the dead burn thick (A. T. Murray)
The Maruts and the thunderbolt

(Feat. Agni and the sharp teeth)

RV 1.143.5

ná yó várāya marútāṁ iva svanāḥ śéneva srṣṭā divyā yáthāsāníḥ
agnír jāmbhais tigitaŕ atti bhárvali yodhó ná sátrūn sá vánā ny ōnjate

“Who is not to be hindered, like the roar of the Maruts, like an army unleashed, like a heavenly missile, with his sharp fangs Agni eats; he devours. Like a fighter his rivals, he bears down on the trees.”

RV 1.88.5 (Maruts)

etát tyán ná yójanam aceti' sasvár ha yán maruto gótamo vah
pásyan hiranyacakrān ' áyodamśtrān vidhāvato varāhūn

“Just now it has appeared, not (even) a wagon-trek away—the (formulation) that Gotama (has made) in private for you, Maruts, upon seeing your golden-wheeled (chariots) and (you) copper-tusked boars streaking across (the sky)”

RV 1.86.6 (Maruts)

yūyáṃ na ugrā marutaḥ sucetún ' āriṣṭagrāmāḥ sumatīṁ pipartana
vo didyúd rádati krivirdati' rināti paśvāḥ südhiteva barhānā

“mighty Maruts, you invulnerable band—with kind attention deliver our benevolence.

Your missile with its gory teeth scraps (a path), mightily it liquefies (the trees) as a well-placed (goad) sets the livestock flowing.”
If arrows...

are swift
are bright
are feathered
bring diseases/plague
are thunderbolts (Maruts)

And why?

Then might the plague be represented as a thunderbolt?
Thunderbolt’s plague = a *fulminant* plague?

*Aesch. Pers. 715-716*

Δα. τίνι τρόπωι; ἄλοιμοῦ τις ἡλθε σκῆπτος ἢ στάσις πόλει;  
Βα. οὐδαμῶς, ἀλλ’ ἀμφ’ Ἀθήνας πᾶς κατέφθαρται στρατός.

- How did it happen? Did some *stroke of plague* or factional strife come upon the State?  
- Neither; but near Athens our whole host has been brought to ruin.
Danse Macabre, fresco on the Black Plague from the XIV century
Oratorio dei Disciplini, Church of Clusone (Bergamo, Italy)

Thank you for your attention!