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Milk and the Indo-Europeans

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Recent evidence from archaeology and ancient DNA converge to indicate that the Yamnaya culture, often regarded as the bearer of the Proto-Indo-European language, underwent a strong population expansion in the late 4th and early 3rd millennia BCE. It suggests that the underlying reason for that expansion might be the then unique capacity to digest animal milk in adulthood. We examine the early Indo-European milk-related vocabulary to confirm the special role of animal milk in Indo-European expansions. We show that Proto-Indo-European did not have a specialized root for ‘to milk’ and argue that the IE root *h₂melg- ‘to milk’ is secondary and post-Anatolian. We take this innovation as an indication of the novelty of animal milking in early Indo-European society. Together with a detailed study of language-specific innovations in this semantic field, we conclude that the ability to digest milk played an important role in boosting Proto-Indo-European demography.

Keywords: Indo-European, etymology, DNA, archaeology, Yamnaya culture

Introduction

The Indo-European hypothesis is well over two hundred years old. A strong consensus exists among linguists on the existence of an Indo-European proto-language. There is no disagreement on which languages are Indo-European and which are not. There is also a broad consensus that the first split in the family separated the Anatolian branch, whose main representative is Hittite, from the rest, which we refer to as “Core Indo-European” in this paper. There exists a healthy range of opinions on issues of reconstruction. Beyond these, areas under discussion relate to the location of the homeland, the time depth of the ancestral language and the subsistence of the original community.
Regarding these issues, mainly two theories are in presence: the Pontic Steppe theory, supported by a majority of scholars, and the Anatolian theory. The first identifies the ancestral group with Yamnaya culture, in the steppes north of the Black Sea around 4000 BCE or slightly later, and argues that Proto-Indo-European speakers were hunter-gatherers or pastoralists. Archaeologists working under the Pontic Steppes hypothesis (Mallory 1989; Anthony 2007) have presented detailed accounts of the interface between archaeology and linguistics. An unresolved issue is that the Pontic Steppes hypothesis has not so far provided a principled answer to the question of why the Indo-European languages have replaced the languages of the farmers over much of Europe and South Asia, despite the presumably more favorable demography of farmers. The Anatolian theory arose as an attempt to answer this question. Renfrew (1987) proposed that the first Indo-Europeans were western Eurasia’s first farmers, who domesticated barley and wheats in Anatolia 10,000 years ago; and that the success of their languages was the direct result of the success of agriculture. According to him, the languages of the farmers are now spoken over large tracts of western and southern Eurasia because the demography of farmers is generally more favorable than that of hunter-gatherers or pastoralists. Accordingly, the Anatolian theory currently places Proto-Indo-European speakers in Anatolia ca. 6500 BCE. The Anatolian theory of Indo-European origins is one of the models for the more general Farming/Language Dispersal Theory.

More than the mismatch between the alleged early date of Proto-Indo-European and the reconstructability of wheeled transport vocabulary – which absolutely cannot be as old as agriculture – it is the absence at the highest node in the Indo-European tree of a clear, diversified Proto-Indo-European agricultural vocabulary (Uhlenbeck 1895, 1897; Kortlandt 2009), which reveals the basic problem of the Anatolian theory. Indo-European cereal-related vocabulary exists, but is either regional, semantically too vague to permit the inference of farming, or unrelated to agriculture. Thus Lat. hordēum, –ī n. ‘barley’, often seen as a direct cognate of Germ. *gerst- F. ‘barley’, is a late formation from horridus ‘shaggy, bristly’ > *hōridī-ūm n. ‘ear of barley’, regularly syncopated in *hōrdīum > Vulg. Lat. hōrdēum. The source is PIE *gēr-εrs- ‘to be bristly’; the Germanic word is perhaps independently derived from the same source: ears of barley are indeed strikingly bristly. The cognate set Lat. Cērēs F. ‘goddess of vegetal growth’, Hitt. karaš n. ‘cereal plant’, MoGerm. Hirse m. ‘millet’ (< Com. Germ. *hersija(n)-), does not allow the name of a specific cereal to be reconstructed: rather, it goes back to PIE *herrh₂- ‘satiate’ (cf. Lith. šėrti ‘feed’, Gr. κορέννυμι ‘satiate’) with ‘nourishing substance, kernel’ as intermediate notion. Another well-known name for ‘grain’ was PIE *jē-y-o- (NIL: 407–410), cf. Ved. yāva- m. ‘barley, wheat, grain’ (= YAv. yaaua-), Hitt. ewa- (ewan-) ‘name of a cereal’, Gr. ζείας F.PL. ‘wheat’, Lith. jāvas m. ‘wheat’, pl. javai ‘wheat grains’, OArm. jov ‘sprout’. The possibility of a final laryngeal (PIE *jē-y(h)₂-o-) was assumed because
of a wrong etymological connection with Ved. gāv-yū-tī- f. ‘pasture’ which is unrelated according to Nikolaev (2014: 131). According to Ivanov (2003: 195 ff.), we are dealing with the PIE root *jे ‘to bind, mix’ (LIV²: 314) reflected by AVed. yaúti ‘to unite, bind’ and Lith. yau̯tė ‘to mix’, on which an adjective *jे- ‘mixed’ was built (on the same pattern as Gr. λευκός ‘white’). We may assume that the barytonesis is a marker of nominalization (PIE *jे-o-m. pl. ‘mixed grains’). The original meaning was probably *‘mixed fodder for cattle’.

Words like ‘grain’, ‘awn’ in themselves do not necessarily indicate agriculture: knowledge of such notions is consistent with the collecting of wild cereals, as are words for grinding. Conspicuously lacking in the earliest Proto-Indo-European vocabulary are words for notions that unequivocally indicate agriculture: sowing, weeding, harvesting, fields, seeds for sowing, as well as stable names for domesticated cereals. The Austronesian family, the other model for the Farming/Language Theory (Bellwood 1985), has a much stronger claim of having arisen at least partly as a result of a shift to agriculture: Austronesian vocabulary reconstructable at the highest level includes all the notions (‘to sow broadcast’, ‘to weed’, ‘to harvest’, ‘field’; ‘seeds for sowing’) that are missing in Proto-Indo-European, plus the names of three domesticated cereals: foxtail millet, broomcorn millet and rice (Sagart et al. in press). Proto-Indo-European therefore cannot have been the language of a group of farmers, whether in Anatolia or elsewhere. Instead, Proto-Indo-European vocabulary at the highest level (i.e. including Anatolian) is animal-oriented, with stable names for bovines and ovines, animal fodder, and cattle-drawn carts, at least.

While we think the Anatolian theory is in all likelihood incorrect, we regard the idea that the formation of a language family normally implies demographic expansion as a precious insight of the Farming/Language theory. In this paper, we propose that a demographic mechanism explains part of the success of the Indo-European languages and the demise of the languages that preceded them, although the mechanism we have in mind is different from Renfrew’s. In the first part, we report on recent strands of research in archaeology, human genetics and the early history of dairying. These give additional support to the Pontic Steppe hypothesis by showing that the speakers of Proto-Indo-European were the first in Eurasia among whom the ability to drink milk into adulthood developed, and that this ability became dominant in western Eurasia as a result of Indo-European expansions.

In the second part, we examine the Indo-European dairy vocabulary, especially the verb ‘to milk’ and the noun ‘milk’, and describe historical changes in this vocabulary that testify to the rise of milking activities and the growing importance of animal milk in the early Indo-European diet. Second, we reproduce ancient textual evidence associating adult milk drinking with Indo-European, especially Indo-Iranian, speakers. Finally, we document the earliest evidence for adult milk drinking based on parallel expressions from the ritual Indo-Iranian literature.
In conclusion, we argue that lactose tolerance provided the early Indo-Europeans with a demographic edge and possibly with an increase in physical stature, both leading to military advantage over preexisting farming communities that were economically successful but lacking in the political means to mount a coordinated resistance. Elite dominance of Indo-European speakers led to widespread language shift towards Indo-European dialects on the part of farmers, explaining the success of Indo-European languages over those of their European farming predecessors.

1. The archaeological and genetic background

Recent archaeological and genetic work has provided decisive evidence for the Pontic Steppe theory. Haak et al. (2015) showed that a massive migration of Yamnaya hunter-gatherers out of the Pontic steppes into the Corded Ware culture of NW Europe ca. 4500 years ago established a new population component there, distinct from both palaeolithic hunter-gatherers and early European farmers who had previously spread from Anatolia. Further, in a study of ancient DNA from 101 Bronze Age Europeans, Allentoft et al. (2015) showed that the highest levels of a gene allowing adults to digest lactose and consume raw milk are found in the burials of Yamnaya culture and its offshoots the Corded Ware and Afanasievo cultures. They state that by 3000 BCE Yamnaya culture had replaced Neolithic farmers from Hungary to the Urals: they regard the Corded Ware culture of northwestern Europe as possibly derived from Yamnaya, but also including Neolithic farmers. They date its establishment at 2800 BCE. Despite the differences in dates, both Haak et al. and Allentoft et al. link the westward Yamnaya migration with the spread of Indo-European languages in Europe; Allentoft et al. further argue that the spread of lactose tolerance in Europe is due to Indo-European expansions.

Different strands of recent work on dairying in Neolithic Europe provide useful background on the development of lactose tolerance in Europe. As recently as 7000 years ago all human populations were lactose-intolerant (Leonardi et al. 2012): adults lacked the enzyme lactase and could not digest the sugar lactose contained in milk. Lactose tolerance arose independently in several of the world’s populations, both in Africa and Eurasia. As for Eurasia, the areas of maximum lactase persistence, as mapped by Leonardi et al., broadly coincide with the Corded Ware culture in NW Europe and with a zone centered on coastal Pakistan, extending into southeastern Iran and northwestern India. This is consistent with a link between lactose tolerance and the spread of Indo-European speakers.

The invention of cheese, a milk derivate poor in lactose, by early farmers in Northwest Anatolia ca. 8500 BP (Evershed et al. 2008) for the first time allowed
humans to turn animal milk into a stable source of food. This presumably contributed to the positive demography of early farming populations. As they spread over Europe, the farmers brought cheese-making with them (Salque et al. 2013). However, they were themselves largely lactose-intolerant (Burger et al. 2007; Allentoft et al. 2015): the capacity to directly drink animal milk results from a genetic mutation allowing the enzyme lactase to persist in adults, a mutation which only arose a few millennia later. We follow Burger (oral remarks cited in Owen 2010) in supposing that contact with cheese-making farmers revealed the lactase persistence gene in certain hunter-gatherer individuals from the Pontic steppes, and that this beneficial gene was subsequently strongly selected for. Presumably, the incidence of the gene rapidly increased in the Yamnaya population, fostering population growth; increased reliance on animal milk required more pasture lands; these became scarce in the homeland area, leading to migrations and territorial expansions – towards Afanasievo culture in the Minusinsk basin before 3000 BCE (perhaps ancestral to the Tocharians); towards northern Europe and towards the Andronovo culture (perhaps ancestral to Indo-Aryan) around the Sea of Aral in the early/mid-second millenium BCE.

In the next section we examine the linguistic and philological evidence on the place of milk in the early Indo-European diet.

2. Linguistic and philological evidence on the place of milk among Indo-Europeans

In this section, we examine the Proto-Indo-European word for ‘to milk’ (2.1), starting with Hittite (2.1.1), then moving to the Core IE root *h₂melg- ‘to milk’ (2.1.2). In an excursus in Section 2.1.3 we discuss the Indo-Iranian root *dʰaug-, both ‘to milk’ and ‘to give milk’. We next move on to the noun ‘milk’: we first examine languages where both ‘to milk’ and ‘milk’ are from *h₂melg- and those where only ‘to milk’ is from *h₂melg- (2.2). We discuss, and reject, the widely accepted equation between Gr. γάλα n. ‘milk’ and OArm. kat’n ‘id.’, proposing a new etymology for Gr. γάλα (2.2.1). Our new etymology for Lat. lac, lactis n. ‘milk’ (2.2.2) tentatively places it under the root IE *h₂melg- ‘to milk’. We then show that the Core IE root *h₂melg- ‘to milk’ (2.2.3) is secondary, suggesting it originates in a Core IE compound *h₂mH-lég-, gen. *h₂mH-lég-ós ‘he who collects (*lég-) liquids/milk’. In Section 2.3, we scan Greek and Latin texts for evidence of milk-drinking among “barbarian” adults: Homer and Homeric scholia (2.3.1), Hesiodus (2.3.2), Hippocrates (2.3.3), Herodotus (2.3.4) and Pliny the Elder (2.3.5), showing that all such references point to speakers of Indo-European languages. In a conclusion to Section 2 (2.3) we note the involvement of milk with Indo-Iranian ritual, pointing
out that it prescribes milk drinking by adults. Finally, in our general conclusion we describe the demographic and biological mechanisms through which milk-drinking promoted the spread of Indo-European languages and the demise of the languages of early European farmers.

2.1 Indo-European words for ‘to milk’

2.1.1 Hittite

Hittite does not have a specialized verb ‘to milk’. Milking was practiced but the the texts either use the Hittite root ḥā- ‘to let, make flow’ (< PIE *leh₁- ‘to let’), for instance GA lättat ‘he let the milk flow = he milked’ (Kbo III 8 III 30–31), or the locution GA ḥamikta ‘he pressed the milk, he milked’ (KBo III 8 III 12–13), where GA, the sumerogram for ‘milk’, is more probably an accusative of product or result than an accusative of direct object. The verb ḥamikta ‘he pressed’ is from the nasal-infixed present stem ḥaminik- ‘to tie together, press together’ (< PIE *h₂emgʰ- ‘to squeeze; narrow’). A third expression occurs in Hittite texts: ḥūratiššan ḥamikta ‘he squeezed the udder’ (KBo III 8 III 12–13). This makes it likely that like Anatolian, its primary branch, Proto-Indo-European lacked a specialized root for the verb ‘to milk’. However, this is only an argumentum ex silentio.

The Hittite name for ‘milk’ cannot be recovered due to generalized use of the sumerogram GA: consequently the Proto-Indo-European word for ‘(to) milk’ cannot be known either. Only a Proto-Indo-European root for ‘to suck mother’s milk’ is known: *d₂eh₁- (<LIV²: 138 ‘Muttermilch saugen’). The same root (with *-i-extension) is well attested in Anatolian (cf. Hitt. tēdan ‘teat’ < *d₂êh₁-i-tom).

1 The archaic reduplicated neuter stem PIE *d₂êd₁h₁-i ‘mother’s milk’ (Ved. dādhi, dādhnās n. ‘thick sour milk’) underwent a sporadic shift to a generic name for ‘milk’, as is clear from OPr. danan n. ‘milk’.

2.1.2 The Core IE root *h₂melɡ- ‘to milk’

This root is widespread among Indo-European languages outside of Anatolian: Lat. mulgeō, ēre ‘to milk’ (< PIE iterative stem *h₂molɡ-éj-e/o-), reflected by Rom. mulge, It. mungere, OFr. moudre (< Vulg. Lat. *mulgērē); Gr. ἀμέλῳ ‘to milk’ (< PIE root present *h₂molɡ-e/o-), whence MoGr. ἀλμέγω (Vulg. ārmēgō); Lith. mīlžti (present stem mēlžu) ‘to milk’; OCS mlěšti ‘id.’; Com. Germ. *mel(u)kan’ (OE melcan, MoGerm. melken and melchen). Albanian agrees with the reflex of a e-grade present stem as well (Alb. mjell ‘to milk’). Common Celtic is unique among Indo-European

1. According to Kloekhorst (2008:877), the lenition is triggered by the preceding accented diphthong.
languages of Europe in reflecting a zero-grade thematic root present: Com. Celt. *mlig-eco- ‘to milk’ (< PIE *h₂mlēg-ē/o-), whence OIr. bligim ‘id.’ and Gallo-Rom. *blig-āre ‘id.’ (< Gaul. *blig-) reflected by OFr. blechier ‘to milk’, mostly famous for its designation of a French cheese: Roblochon (or Re-), which is made from milk of a second milking (cf. OFr. re-blechier ‘to milk a second time’). Root *h₂melēg- ‘to milk’ is also found in the very far east of the Indo-European domain: Toch. B *malkwer n. ‘milk’ and Toch. A *malke ‘id.’. These Tocharian nominal stems are not likely to be directly inherited from the Ursprache: rather, they point to an unattested verb Com. Toch. *mālk- ‘to milk’ (< Core IE *h₂mlēg-).

It is noteworthy that there is no evidence at all for root *h₂melēg- ‘to milk’ in Indo-Iranian, not even in the modern dialects. The Vedic Narten present márj-mi ‘to rub’, sometimes presented as related to *h₂melēg- (e.g. Mayrhofer EWAIa II: 325), must in fact relate to a distinct root, namely *h₂merēg- ‘to wipe clean, cleanse, purify, remove completely’.2 The two roots have largely non-overlapping semantics, although the derived meaning ‘to pluck’ in Gr. ἀμέργω ἄγω ‘pluck’ (always applied to plant products) could be construed as similar to the action of milking.3 The fact that Vedic márj-mi ‘to rub’ and other Indo-Iranian forms under the Vedic root MRJ- ‘to wipe, brush’ seem to regularly reflect *h₂melēg- ‘to milk’ is the result of the merger of PIE *l and *r in Indo-Iranian: IIr. *marj- can reflect both *h₂melēg- and *h₂merēg-. In addition, the initial laryngeal *h₂ in *h₂merēg- is problematic: there is no reflex of it in Vedic or in Avestan – Mayrhofer’s reluctance to assume an Indo-Iranian etymon *(H)marj- is understandable (ibid.).4 The proposed *h₂- relies exclusively on initial ā- in Gr. ἀμέργω: but the alternation with initial ō- in the related form ὀμοργψ ‘to dry’ (< *το rub, wipe out’) is not consistent with *h₂-:5 It is more probable that initial ā- in ἀμέργω is the fruit of contamination from the phonetically and semantically similar, but etymology distinct verb ἀμέρδων ‘to deprive, take away’.6 The by-form ὀμοργψ ‘to dry’ itself is analyzable as an old preverbed zero-grade stem *h₂o-merēg-neh-, with a dialectal reflex of *r. As a result, *h₂merēg- should be emended to *merēg-, without a laryngeal initial, removing it further away from *h₂melēg- ‘to milk’.

2. Cf. Late Av. ni-marzīša- ‘best cleanser’ (of Ahura Mazda).
3. E.g. in καρπόν ἀμέργῳν πεποτημέναι ‘they pluck the fruit on their wings’, of bees (AP 1. 882).
4. As pointed out by a reviewer, the lengthened reduplication of the Vedic perfect māmrj- may be considered an argument for ‘Hmarj- but it must be admitted that it is not very strong.
5. Mid.: ‘to dry oneself’ (most often tears), # δάκρυν ὀμορθαμένην ‘drying her tears’ (λ 530).
6. PIE *h₂mrd- ‘to harm, mistreat’ (LIV²: 280, s.v. *h₂mrd- ‘ein Leid antun, mißhandeln’). Note the confusion between ἀμέρσας and *ἀμέρξας in AP 7.657.7, pointed out in BDAG: 2015, 107, s.v. ἀμέρδω.
This in fact suggests a likely explanation for the lack of Indo-Iranian reflexes of *h₂.melg- ‘to milk’: homonymic clash with a verb ‘to rub, wipe etc.’ reflecting *merg- may have caused Indo-Iranian speakers to replace *h₂.melg- ‘to milk’ with an innovated form, in this case *dʰ.augʰ- (discussed in Section 2.1.3 below). Homophony between a verb ‘to rub’ and a verb ‘to milk’ would have been particulary undesirable, since rubbing a cow’s udders during milking is painful to the animal, causing it to balk, as is well known to those who practise milking. A homophonic clash of *h₂.melg- ‘to milk’ and *h₂.merg- ‘to rub, etc.’ occurs only in Indo-Iranian because only Indo-Iranian does lose the distinction between *l and *r. In Section 2.2.5., we will propose a new etymology for *h₂.melg- ‘to milk’.

To sum up, Vedic márj-mi and other forms under the Vedic root MRJ- ‘to wipe, brush’ may be connected to Gr. ἀμέργω ‘pluck’ (earlier *μέργω): both are from a root *merg- without a laryngeal, and without any significant connection to *h₂.melg- ‘to milk’.

2.1.3 Excursus: Indo-Iranian *dʰ.augʰ- ‘to milk; to give milk (of a cow)’

It is generally assumed that the IIr. root *dʰ.augʰ- ‘to milk; to give milk’ directly reflects PIE *dʰ.eugʰ- ‘to be efficient’ (Mayrhofer EWIA 1: 747–8), making it a very ancient root and raising the possibility that Proto-Indo-European may have had another verb ‘to milk’ competing with *h₂.melg-. Indeed, the Vedic verb exhibits a very archaic conjugation pattern, associating an athematic root active present in PIE 3sg. *-ti, 3pl. *-énti: dógdhí 3sg., duh-ánti 3pl. ‘to milk (a cow), extract (soma)’ (< PIE *dʰ.eugʰ-ti, *dʰ.uugʰ-énti) with a middle present in PIE 3sg. *-όj, 3pl. *-rój: duh-é 3sg., duh-re 3pl. (< PIE *dʰ.uugʰ-ój, *dʰ.uugʰ-rój). This supports the Indo-Iranian verb’s Proto-Indo-European antiquity and is consistent with a link to the PIE root *dʰ.eugʰ-, at least on a phonological plane.

At the same time, in the languages (outside of Indo-Iranian) where it is attested, the root *dʰ.eugʰ- is unrelated to milk: Gr. τεῦχω, ‘to do, make, prepare, build’, Com. Germ. *duganəm (intr.) ‘to be fit, avail’ ~ *daug- (o-grade) ‘id.’ (Go. daug 3sg.prf-prs. ‘id.’, G. tugen ‘id.’). In addition, there are no expressions using the PIE root *dʰ.eugʰ- and meaning ‘to produce milk’, whether in Greek, Germanic or Indo-Iranian. Moreover, a semantic shift from ‘to produce’ to ‘to milk’ strikes us as unmotivated. These points seem to argue that the IIr. root *dʰ.augʰ- ‘to milk; to give milk’ acquired its connections to milk no earlier than Indo-Iranian, and not as a result of a straightforward semantic shift.

Based on an old suggestion of Szemerényi, we attempt a new solution to this conundrum. Almost sixty years ago, Szemerényi (1958: 171, fn. 3) suggested that the IIr. root *dʰ.augʰ- ‘to milk’ is a back-formation from the Indo-Iranian name for ‘daughter’ (IIr. *dʰ.uugʰ-H-tár-), which he thought had originally meant ‘suckling child’ or the like. Szemerényi’s proposal has against it the fact that a back-formation
in Indo-Iranian times from ‘daughter’ could not have possessed the archaic conjugation pattern of IIr. *dʰaugʰ-. His hypothesis has met with a great deal of resistance among scholars. Yet it can be adapted as follows. We assume an unattested action noun PIE *dʰéug₁h₂-e/os- n. (< *dʰé(h₁)-u-g₁h₂-e/os ) ‘action of sucking mother’s milk’, ultimately based on the PIE root *dʰéh₁ ‘to suck mother’s milk’, whose u-stem PIE *dʰé(h₁)-u- adj. ‘female, breastfeeding’ had a velar enlargement *dʰé(h₁)-u-g- with a concrete meaning ‘teat (vel sim.)’. This secondary derivative served as the basis for an amphidynamic abstract noun PIE *dʰé(h₁)-u-g₁h₂ (gen.sg. *dʰ-u-g₁h₂-s) ‘femininity’. From this hypothetical form the Proto-Indo-European name for ‘daughter’, containing an athematic variant of the “characterizing” suffix *-ter-o- (Pinault 2007) can be derived: *dʰ(h₁)-u-g₁h₂-tér-. Semantically a daughter would then be a ‘suckling [female] child’, or, perhaps more convincingly, a person giving suckle, assuming the term first designated daughters of child-bearing age. Because PIE *g₁h₂ and *gʰ merge as *gʰ in Indo-Iranian – and nowhere else – the secondary derivative PIE *dʰéug₁h₂-e/os- n. would have resulted in IIr. *dʰąug⁽ʰ⁾-H-as, *dʰąug⁽ʰ⁾-H-as- n. ‘sucking’ (whence also ‘milking’). This term is in fact attested as Ved. dōh-as ‘milking’. There is another possibility: a thematic secondary derivative PIE *dʰąug₁h₁- o- m. ‘id.’ reflected by Ved. dōgham ‘milking’ (hap. leg.) and by Pašto ḫway ‘id.’ (< Com. Ir. *dauγ-a-). ⁷ As a result of the phonological merger, to Indo-Iranian speakers, *dʰąug⁽ʰ⁾-H-as n. ‘sucking’ or *dʰąug⁽ʰ⁾ H- a- m. ‘id.’ would have seemed to contain the homophonic – but unrelated – primary IIr. root *dʰaugʰ- ‘to be efficient, produce’. This would have resulted in the appearance of a hybrid verb, combining the archaic conjugation pattern of root *dʰéugʰ- and the milk-related semantics of the action noun PIE *dʰéug₁h₂-e/os- (or its thematic by-form *dʰąug₁h₁-o-).

### 2.2 Indo-European words for ‘milk’ derived from ‘to milk’

We have argued that the Core IE root *h₂melg- ‘to milk’ is an innovative form, since Hittite has no specialized root for ‘to milk’. Two sets of languages may be distinguished with respect to this root: (1) those where both the verb ‘to milk’ and the noun ‘milk’ are from *h₂melg- (Table 1), and (2) those where only the verb ‘to milk’ is from *h₂melg- (Table 2). The situation in Tocharian is more complex: the nouns for ‘milk’ in the two dialects: Toch. A malke ‘milk’, B malkwər ‘id.’, have different Common Tocharian etymologies: malke is from Com. Toch. *melk-a-yu (< IE *h₂melg-ōj-), a secondary derivative built on the (isolated) IE action noun

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⁷. The Pašto ḫwaš ‘to milk’, from Com. Ir. *dauš-āja- ‘id.’, may rather reflect IIr. *daγ- ‘to milk’, from IE *deγ- ‘to draw’ (e.g. Ossetic dac-, Wäxi đic-). According to Cheung (2007:66f.), the reconstruction *dauš- is not secure, since most verbs in question can also be explained from Com. Ir. *dauš-ya- < IIr. *daučja- which is required for Ossetic anyway.
*h₂molg-i- f. ‘milking’, whereas Toch. B malk-er is a secondary derivative built on a verbal stem Com. Toch. *milk- ‘to milk’ (< IE *h₂melg-).

The fact that the languages where the verb is derived from *h₂melg- are a subset of those where the noun from *h₂melg- argues in favor of the hypothesis that the nouns are derived from the verb. However, there is clear evidence that we are not dealing with a single innovation: in each language where both the noun and the verb reflect *h₂melg-, the noun has the same vocalic grade as the verb: therefore, terms for ‘milk’ must have been derived independently in the daughter languages of Core Indo-European.

### Table 1. Languages where both ‘to milk’ and the name for ‘milk’ are from *h₂melg-

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<td>‘milk’ (root noun)</td>
<td>‘milk’</td>
<td>‘milking’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘mlixtos m. ‘milk’</td>
<td>‘mlökto- m. ‘milking’</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‘mlaktá f.’ ‘milk flow’ (2.2.4)</td>
</tr>
</tbody>
</table>

### Table 2. Languages where only the verb ‘to milk’ is from *h₂melg-

<table>
<thead>
<tr>
<th>Language</th>
<th>Greek</th>
<th>Lithuanian</th>
<th>Albanian</th>
<th>Com. Slav.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ἀμέλγω ‘to milk’</td>
<td>méžu ‘to milk’</td>
<td>mjel ‘to milk’</td>
<td>*melz-ti ‘to milk’</td>
</tr>
<tr>
<td></td>
<td>γάλα, γάλακτος m. ‘milk’</td>
<td>pienas m. ‘milk’ (Latv. piëns)</td>
<td>dhallë / dhallë́ f. ‘buttermilk’</td>
<td>(*mélkò ‘milk’ &lt; Com. Germ.)⁸</td>
</tr>
</tbody>
</table>

Because the nouns for ‘milk’ in Table 1 are derived from the verb ‘to milk’, their original referent must have been ‘animal milk’ rather than ‘mother’s milk’. Other innovative Indo-European words for ‘milk’ are not derived from the verb ‘to milk’. Lith. pienas m. ‘milk’ and Latv. piëns ‘id.’ reflect an IE masculine stem *pójH-no- ‘thick fluid, ‘mother’s milk’ (the acute intonation of Lith. pienas for expected **piënas according to Saussure’s effect is analogical to the Lith. verb póti ‘to have milk’).

From the underlying IE root *pejH-/*pieH- ‘to be thick’ (LIV²: 464 ‘anschwellen’), a neuter stem *pejH-mn- ‘thick fluid’ was also built. This is reflected by OAv. paémon n. ‘mother’s milk’, MidPers. pém ‘milk’. This term was also borrowed by Fin, piimä ‘sour milk’. The IIr. etymon *pájH-as- n. (Ved. páyas- ‘Lebenskraft’, OAv. paiiah- ‘milk’) reflects IE *pějH-e/os- n. ‘thick fluid’. On the zero grade of pejH-/*pieH- ‘to be thick’, an adjective *piH-jú- ‘thick’ was built, whence the abstract noun *piH-jú-h₂ f. ‘thickness’. That word became the starting point for a secondary derivative *piH-jú-h₂-s-ó- ‘thick fluid’ (cf. Ved. piyūṣa- m.n. ‘colostrum, the milk of

⁸ A borrowing from Germanic (Derksen 2008: 307). Ru. молозиво н. ‘colostrum, beestings’ is inherited.
a cow during the first seven days after calving, biestings, any thick fluid’). According to Garnier (2016b: 1.8), the primary root is PIE *(s)peh₁- ‘to swell, get fat, fatten, thrive’, with an acrostatic neuter PIE *(s)póh₁-i ‘fat’. The adjective PIE *(s)póh₁-i-tó- ‘full of fat, having corpulence’ underwent the regular metathesis of laryngeals: PIE *(s)póh₁-tó- ‘fattened, fat’ and PIE *(s)póh₁-nó- ‘swollen’, reinterpreted as participles of a secondary root IE *(s)peh₁- ‘to be fat, be thick’.

2.2.1 Other innovative forms for ‘milk’: Gr. γάλα n. and OArm. kat’n.

An etymological link is widely assumed between Gr. γάλα n. ‘milk’ and OArm. kat’n ‘id.’ (Dial. Arm. kaxc’). A link cannot be taken for granted. According to Martirosyan (2010: 345–6), the Armenian forms reflect a proto-Arm. paradigm nom.sg. *kac’ (< *kalc’ < PIE *glk-t-s), acc.sg. *kalt’n (< PIE *glk-t-m), levelled to *kac’, *kat’n; this in OArm. kat’n, used as both nominative and accusative while the dialects exhibit the symmetrical levelling *kalc’, *kalt’n with analogically re-introduced velar l, and extension of the old nominative *kalc’ (Dial. ModArm. kaxc’) throughout the whole paradigm. This theory relates the Armenian forms to an IE etymon *glk-t-s and appears to provide a viable link to Gr. γάλα, γάλακτος. However, it stumbles upon three obstacles. First, the animate gender of the PIE etymon *glk-t-s, acc. *glk-t-m, does not match the neuter gender of Gr. γάλα. Second, from a Greek point of view, the unexpected disyllabism of the stem γάλακτ- is hardly compatible with an original stem *glk-t-. Third, as recently demonstrated by Kümmel (2017: 445f.), the inner-Armenian connection of kat’n with kit’ ‘milking; harvest’ and kowt’ ‘harvest’ is no longer compatible with a reconstruction *glkt-.

An alternative and perhaps preferable explanation is to posit an etymological link between Gr. γάλα and Alb. dhallë / dhalltë e. ‘butter milk’, reflecting a Proto-Alb. *dzalà- ‘id.’ (whence also the Rom. loanword zarà ‘id.’), where *d regularly reflects a PIE palatal *g. Not a pure velar *g. On the basis of the Homeric formula γάλα λευκόν ‘white milk’ (Δ 434, E 902), we propose an origin of the Greek and Albanian forms in a color adjective Gr. γάλακτ-ακος *‘white’; this form is actually attested, with the meaning ‘a kind of a shell, prob. Mactra lactea’ (Aristot. HA 528a 23). Mactra lactea is white in color. This adjective, reflecting a PIE stem *gelh₂-ŋ-k ‘bright, white’ from PIE *gelh₂- ‘to shine’, could have resulted in a substantivized neuter Gr. γάλα. The dental stem of gen.sg. γάλακτ-ακος would be secondary. As a typological parallel, we may mention MoAr. laban m. ‘milk, whey’ with root LBN- ‘to be white’. 
2.2.2 Other innovative forms for ‘milk’: Lat. lac, lactis N.

Contrary to a tenacious legend,9 this Latin word has nothing to do with Gr. γάλα, γάλακτος N. ‘milk’. Garnier (2016: 306–7) proposes that Lat. lac, lact-is N. ‘milk’ is a back-formation.10 The stem *lact- would be from an unattested verb *ambi-blactare ‘to milk’11 resulting from *ambi-blactare ‘to milk with both hands’ through haplogony; *ambi-blactare itself underwent depreverbalization to lactare ‘to milk’, and a stem *lact- ‘milk’ was extracted through back-formation. The underlying Proto-Indo-European root must have been IE *h₂melg- ‘to milk’ (cf. Gr. ἀμέλγω, Lat. mulgēō). We may envision an action noun IE *h₂mölg-to- M. ‘the milking’, regularly metathesizing to Common Italic *mlôk-to m.; this then further affected with Italic collective suffix -ā of concrete meaning (< IE *-eh₂), giving ‘milk flow’; affixation of -ā in turn required change to zero degree still in Italic. One would have expected *molk-tā (< *mlk-tā) but due to analogy with the strong stem *mlôk-to, resyllabification resulted in *mlāk-tā f. ‘milk flow’, coexisting with *mlôk-to at Common Italic level.12 In turn, *mlāk-tā regularly evolved to unattested Lat. *blactā-, out of which *ambi-blactare ‘to milk with both hands’ was formed.

2.2.3 A new etymology for IE *h₂melg- ‘to milk’

The IE root *h₂melg- ‘to milk’ is phonologically too complex to be primary. Its meaning is both highly specialized and remarkably stable across languages, despite widespread attestation, suggestive of a relatively recent formation. Benveniste (1935: 157) assumed a primary root *h₂em- ‘to collect liquid’ (cf. Gr. έμην f. ‘bucket’) with nominal enlargement PIE *h₂emH₂- in his notation. As a parallel to the proposed -el-g- enlargement, he cited Ved. सvargā- adj. ‘heavenly’ which he took to be from PIE *s₂-él-g-. Kümmel (LIV2: 265) reconstructs the same root with a final laryngeal: PIE *h₂emH₂- ‘to pour’. Reflexes are Com. Celt. *ande=am-je/o- ‘to pour [water] upon’ (cf. OIr. and.aim ‘to wash’) and the doublet Com. Celt. *ad=am-je/o- ‘id.’ (cf. v.-irl. ad.aim), supported by Matasović (2009: 31). The fact that *h₂emH₂- was

9. Szemerényi (1991: 1117) and Leumann (1977: 187) assume for Lat. lac, lactis a PIE etymon *glakt- N. ‘milk’ supposedly also explaining the Greek forms. This etymology is maintained by Weiss (2011: 147, fn. 82).

10. Archaic nominative lact in Varro (Men. 26), deemed incorrect by Julius Caesar according to Pompeius Grammaticus (GLK 5: 199). Vulgar form lactē in Plautus (Bacch. 6), prefiguring the Romance evolution (cf. It. latte).

11. The by-form lactē (pl.) would be a back-formation from a vulgar doublet *lactāre ‘to milk’.

12. Such a resyllabation may be paralleled by OHG nusta f. ‘Verbindung’ (< Com. Germ. *nustōr), analogous to the strong stem Com. Germ. *nāstā m. ‘binding’ (< PIE *Hnōd̕-to-), instead of phonetically expected unstō according to Griepentrog (1995: 457).
the verb used for pouring or collecting milk is clear from textual evidence: Hom. ἀμάομαι 'to draw milk, collect' (mid. ἀμάομαι) is said of curdled milk in 1 247:

αὐτίκα δ’ ἡμιν μὲν θρέψας λευκοίο γάλακτος πλεκτοῖς ἐν ταλάροισιν ἄμησάμενος κατέθηκεν, ἡμιν δ’ αὑτ’ ἐστησεν ἐν ἄγγεσιν, ὃφρα οἱ εἴη πίνειν αἰνυμένῳ καὶ οἱ ποτιδόρπιον εἴη.

He curdled half the white milk and collected it in wicker strainers, but the other half he poured into bowls so that he might drink it for his supper.

The secondary derivative Gr. ἄμης, -ητος m. ‘milk cake’ (Aristoph., Ploutos 999) is perhaps from an unattested masculine or neuter o-stem *ἄμος ‘milk left to curdle in a bucket, curdled milk’. The Greek word ἄμη f. ‘bucket’ is considered a back-formation (Dieu 2016: 112). We propose that IE *h₂melg- ‘to milk’ is a secondary root based on a compound *h₂mH-lēg-, gen. *h₂mH-lēg-ós ‘one who collects (*lēg-) liquids/milk’. We assume this compound dates back to a period preceding the formation of Core Indo-European since its derivatives meaning ‘to milk’ and ‘milk’ are widespread in the daughter branches of Core Indo-European, including Tocharian. Phonologically, the old gen.sg. *h₂mH-lēg-ós resulted in *h₂mlg-ós with hiatus, whence resyllabation as *h₂mlg-ós. For a parallel, cf. the resyllabation in the Proto-Indo-European name for ‘wind’: PIE *h₂ueḥ₁-nt-ό-nt-*h₂ueḥ₁-nt-ό-→*h₂uent-ό- m. ‘wind’ (cf. Go. winds, Lat. uentus), a derivative of appurtenance (‘the fast one’) built on the PIE nt-stem *h₂uh₁-ont-, *-nt-ės ‘running’ (Garnier 2014: 63). Finally, through back-formation IE *h₂mlg- ‘milker’ would have triggered the creation of the secondary root *h₂melg- ‘to milk’, out of which several words for ‘milk’, described above, would later be derived: pre-Core IE *h₂mlg- ‘milker’ → Core IE *h₂melg- ‘to milk’ → Post-Core IE names for ‘milk’.

2.3 Greek and Latin textual evidence for milk-drinking among Indo-European “barbarians”

2.3.1 Homer and Homeric scholia
Homer’s Iliad already alludes to milk-drinking among a legendary people of pastoral nomads referred to as “the lordly Hippemolgi”; Herodotus mentions the (Indo-Iranian) Scythians, who drink mare’s milk. Let us start with the very beginning: Homer’s Iliad, in which dairy culture was first depicted.
Those words became enigmatic to the ancients themselves; this very passage was widely commented\(^\text{14}\) by antique scholiasts, who identified the Abii either with the Scythians or the (equally Indo-Iranian) Sarmatians:

1. γλακτοφάγων Ἀβίων τε δικαιοτάτων ἀνθρώπων. ταλακτίνες ἐθνος, οἱ γαλακτοπόται. Τινὲς τούτους Σαρμάτας φασίν. (II. xiii.5) “dairy (?) people, who are milk-drinkers. Some also call them Sarmatians.”

2. Ἀβίων· πάντων Σκυθῶν ὑποκυψάντων Ἀλεξάνδρῳ μόνους Ἀβίους φασίν οὐχ ύπεῖξαι. “The Abii: amongst all Scythians who have bowed to Alexander the Great, it is said that only the Abii didn’t surrender.”

3. οὓς δικαιοτάτους φησί διὰ τὸ ἀνεπίμικτον “(Homer) says they are the most righteous among men for their people is unmixed.”

4. Ἀβίων· τῶν νομάδων Σκυθῶν “Abii: the nomad Scythians.”

5. τινὲς δὲ τούτους Σαρμάτας φασίν “some others call them Sarmatians”

Modern scholars\(^\text{15}\) identify the Abii either with the legendary Hyperboreans, or with the Gabii mentioned by Aeschylus in a fragment of Prometheus Unbound (fr. 186). Aristarchus himself endeavoured without success to distinguish between epithet and ethnonym in Homer’s Iliad (N 5–6). The word ἵππημολγός could be understood as an epitheton meaning ‘mare-milkers’ (cf. Gr. ἵππος m.f. ‘horse, mare’), associated to Hom. ἀγαυός ‘noble’ and to metrically syncopated # γλακτο-φάγος ‘cheese-eaters’ (here standing for †# γαλακτο-φάγος). Even the word ἄβιος could be understood as an epitheton: ‘without (fixed) subsistence’, whence ‘nomad’ (Gr. βίος m. ‘life’ means also ‘means of life, resources, sustenance’).\(^\text{16}\) The legendary Abii who have occasioned so much discussion may eventually be nothing else but

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\(^\text{13}\) Those are the Mysians living on the shore of the Danuvius, not the Mysians from Asia.

\(^\text{14}\) Text of the scholia by Erbse (1974: 392–396).


\(^\text{16}\) See for instance βιόν πορίζειν τιν “to furnish s.o. the means of sustenance” (Aristoph. Ve. 706).
a ghost-word; but the fact that a dairy nomad tribe living on milk and “without fixed subsistence” (that is to say without agriculture) is referred to in this passage is beyond doubt.

2.3.2 **Hesiodus**

\[\text{Γλακτοφάγων ἔς γαῖαν ἀπῆνας οἴκι ἔχόντων (fr. 54)}^{18} \] [probably Scythians]

To the land of Cheese-Eaters, whose houses are chariots.

2.3.3 **Hippocrates**

In his famous treatise *Airs, Waters, Places*, 18, Hippocrates depicts the Scythians’ milk-based diet: \[\text{Αὐτοὶ δὲ ἐσθίουσι κρέα ἑφθὰ καὶ πίνουσι γάλα ἱππων. Καὶ ἰππάκην τρώουσι· τοῦτο δὲ ἐστὶ τυρὸς ἱππων.} \]

“They themselves eat boiled meats and drink mares’ milk.\(^{19}\) They have a sweet-meat hippake,\(^{20}\) which is a cheese from the milk of mares.”

2.3.4 **Herodotus: The Massagetae and the Scythians**

2.3.4.1 **The Massagetae**

\[\text{γαλακτοπόται δ᾽ εἰσί (Hdt. i.216)} \]

“the Massagetae are milk-drinkers”.

2.3.4.2 **The Scythians** (Hdt. iv.2.1–2)

(1) \[\text{Τοὺς δὲ δούλους οἱ Σκύθαι πάντας τυφλοῦσι τοῦ γάλακτος εἶνεκεν τοῦ πίνουσι ποιεῖντες ὄδε. Ἐπεάν φυσητήρας λάθωσι ὁστείνους αὐλοίας προσεμφερεστάτους, τούτους ἐσθέντες ἐς τῶν θηλέων ἵππων τὰ ἄρθρα φυσώσω τοίς στόμαι, ἄλλοι δὲ ἄλλων φυσώντων ἁμέλγουσι. Фασὶ δὲ τοῦτῳ εἶνεκα τοῦτο ποιεῖν· τας φλέβας τοῦ πιμελασθαι φυσωμένας τῆς ἱπποῦ καὶ τῷ ὀδόρα κατίεσθαι.} \]

(2) \[\text{Ἐπεάν δὲ ἀμέλξωσι τὸ γάλα, ἐσχέαντες ἐς ἅπαν ἄγγην οὐκαὶ καὶ περιστίξαντες κατά τὰ ἀγγήν ταῦτα τυφλῶς δονέουσι τὸ γάλα, καὶ τὸ μὲν αὐτοῦ ἐσπαστάμενον ἀπαρύσαντες ἠγεύναι εἶναι τιμιώτερον, τὸ δὲ ὑπιστάμενον ἠσον τοῦ ἔτερου.} \]

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17. In this case, we may amend the *textus traditus* as follows: Μυσίων τ’ ἀγχεμάχων καὶ ἀγαυῶν *ἵππυμολογόν* # γλακτοφάγων *ἄβιον* τω δικαιιστάτων *τ’ ἀνθρώπων* (N 4–6) “and upon the land of the illustrious Mysians that fight in close combat, mare-milkers, cheese-eaters, without (fixed) subsistence, the most righteous of men.”


20. This Greek word could be a calque of an Iranian word, *aspa-kā* or the like.
“(1) Now the Scythians put out the eyes of all their slaves because of the milk which they drink; and they do as follows: they take blow-pipes of bone just like flutes, and these they insert into the vagina of the mare and blow with their mouths, and others milk while they blow: and they say that they do this because the veins of the mare are thus filled, being blown out, and so the udder is let down. (2) When they have drawn the milk they pour it into wooden vessels hollowed out, and they set the blind slaves in order about the vessels and agitate the milk. Then that which comes to the top they skim off, considering it the more valuable part, whereas they esteem that which settles down to be less good than the other. For this reason the Scythians put out the eyes of all whom they catch.”

2.3.5 Pliny the Elder

*Mīrum barbarās gentēs, quæ lacte uīuant, ignōrāre aut spernere tot sæculīs cāseī dōtem, densantēs id aliqūī in acōrem iūcundum.* (HN xi.96.3),

“It is a remarkable circumstance, that the barbarous nations which subsist on milk have been for many ages ignorant of the merits of cheese, or else have totally disregarded it; and yet they understand how to thicken milk and form therefrom an acrid kind of liquid with a pleasant flavour.”

2.4 Concluding remarks

The Post-Anatolian innovation points to the creation of a “secondary” root *h₂melḡ-* ‘to collect liquid (in a bucket), to milk’. A major part of the Indo-European languages (including Tocharian) used this specialized root to build new names for ‘milk’: Com. Germ. *mel(u)k-α* n. ‘milk’, Com. Celt. *mlīχtos m. ‘id.’, Toch. A *malke, B*malkwer ‘id.’, and (maybe) Lat. *lac, lact-īs n. ‘id’. The highly innovative Balkanic area, although using *h₂melḡ-* as a verbal root (Alb. *mjell ‘to milk’, Gr. *ἀμέλγω ‘id.’), shows a lexical renewal exemplified by Gr. γάλα n. ‘milk’ (< PIE *ǵh₂₁-γ-k- ‘white’) and Alb. *dhallë / dhalltë f.‘buttermilk’, which could reflect Proto-Alb. *dzalā- (< PIE *ǵh₂₂-eh₂₂ f.‘whiteness’). Such “modern” designations point to an innovative name for ‘milk’ as consumed by both infants and adults.

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21. As already mentioned, there is evidence for a similar lexical renewal in Semitic, where the root ‘to milk’ is Periph-LB-, whereas several languages created a new name for ‘milk’ based on √LB- ‘to be white’.
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The Indo-Iranian data are particularly complex: we may admit that the Core IE root *h₂melg- ‘to collect liquid (in a bucket), to milk’ was lost, because of its homophonic confusion with the unrelated root PIE *merg- (cf. Ved. √MRJ- ‘to wipe, brush’). Besides, the Indo-Iranian tribes seem to have been quite significantly living on milk, at the time when they were still nomads: the first mention ever of milk-drinking by lactose-tolerant adults appears to be in the old Indo-Iranian formula *sáušmas jás gāuá ‘soma-juice mixed with (cow’s) milk’, reflected by Late Av. *haomō.yō gauua ‘soma-juice mixed with milk’ (Yt 3.18 ff.). References to milk in Early Vedic texts are ubiquitous and the posterior Ayurvedic literature emphatically states that milk can be consumed by all healthy individuals.


3. Conclusion

Some of the findings in Section 2 are directly interpretable in terms of the genetic and archaeological findings on lactase persistence described in Section 1. First, we have shown that after the separation of the Anatolian branch, and before the breakup of Core Indo-European (dated to ca. 2800 BCE by Chang et al. 2015), a specialized root for ‘milker’ came into existence, out of which a specialized verb ‘to milk’ *h₂melg- was formed. We take the appearance of this term as signalling the new status of animal milking as a well-identified social activity in early Indo-European society. While Proto-Indo-European must have had a word for human milk – not recoverable due to the specificities of Hittite script, we have shown that

22. Whatever soma-juice may have been, it certainly referred to a strong intoxicating liquor – definitely not a beverage for suckling infants.

23. Lectio supported by de Vaan (2003: 370) for the textus traditus, which reads here †haomaiiō.

24. If we may say so, the whole Rig-Veda is crawling with mentions of milk and sperm.

25. See for instance the gnomic stanza: kṣīraṁ sarvesāṁ dehināṁ cānuśete kṣīraṁ pibanti ca na roga eti || kṣīrād pariṁ nānyadhihasti vṛṣyaṁ kṣīraṁ pariṁ nāsti ca jivniyam ||90|| (Ka.Ka. 7.90) “Milk is beneficial for healthy individuals; by drinking milk one does not get diseases (roga-); hence there is no better aphrodisiac (vṛṣya-) than milk; there is no better life-prolonger (jivniyam) than milk.” Note also: pravaram jivniyānām kṣīram uktam rasāyanaṁ ||218|| (Cāraka Saṁhitā Sūstrasthāna 27.218) “Milk is said to be a life-elixir per excellence.”
new Indo-European words for ‘milk’ were formed independently from the verb *h₂melg- ‘to milk’ in the Germanic, Celtic,Italic, Slavic and Tocharian branches: these terms must have designated animal milk for human consumption. This probably indicates a widespread social need for distinct specialized names for the two notions, animal milk and mother’s milk.

By themselves, these linguistic data are silent on whether adult speakers drank animal milk or whether the milk was used to make cheese, or both; though the greater prominence of terms for ‘milk’ compared to those for ‘cheese’ does suggest that milk was directly consumed by adults. Unequivocal linguistic evidence of milk consumption by Indo-European-speaking adults can be found at a later date, in prescribed ritual drinking of soma mixed with milk by Proto-Indo-Iranian adults: lactose-persistence in the Proto-Indo-Iranian population (slightly after 2000 BCE according to Chang et al. 2015) must therefore have reached very high levels. Adult milk drinking by Indo-Iranian peoples is further confirmed by descriptions by Roman and Greek authors. Despite being linguistically Indo-European, Roman and Greek authors considered adult milk-drinking a barbarian custom, perhaps because Roman and Greek populations included a large pre-Indo-European farmer component.

To conclude, we suggest that the ability to drink milk in adulthood played an important role first in boosting Proto-Indo-European demography. A larger population in turn required more milk: the need for more pasture lands is probably one strong motivation behind Indo-European territorial expansion. In confrontations with preexisting farming populations, increased population numbers allowed Indo-European groups to prevail militarily over small, or even not-so-small, farming communities which had until then been secure. As a result Indo-European speakers were able to establish themselves durably as a ruling elite over sedentary farming communities speaking non-Indo-European languages. Like horseback riding, teenage and adult milk consumption may also have amplified the military might of Indo-European raider groups by conferring higher bodily stature to Indo-European individuals with the lactase persistence phenotype (Okada 2004).
### Abbreviations

<table>
<thead>
<tr>
<th>ADJ.</th>
<th>adjective</th>
<th>Plur.</th>
<th>plural</th>
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### References


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