

Y-Haplogroup Frequencies in the Flemish Population

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Abstract

The Flemish are the Dutch-speaking population of the northern part of Belgium and make up 60% of the population. Estimated figures for present-day Americans with Flemish roots amount to more than 1 million. We performed a population genetic study on 113 unrelated Flemish males, who were typed for 12 Y chromosome STRs (DYS19, DYS385 a/b, DYS389 I, DYS389 II, DYS390, DYS391, DYS392, DYS393, DYS437, DYS438 and DYS439). With these 12-locus haplotypes, we deduced the corresponding haplogroup using Whit Athey's Haplogroup Predictor. This yielded the following distribution, typical for a population with northwest European origin: Haplogroup R1b 56.6%, Haplogroup I 28.3%, Haplogroup J 6.2%, Haplogroup E3b 4.4%, Haplogroup G 3.5%, and Haplogroup L 0.9%.

Introduction

The term Flemings (Dutch: *Vlamingen*) is primarily used to refer to the ethnic group native to Flanders (the northern half of Belgium, historically part of the Southern Netherlands), which in total numbers about 6 million people in Belgium (the majority of the 10 million Belgians). In addition, the term also refers to ethnic Flemings in French Flanders (mainly in the Département du Nord of present-day France), in the southern part of the Dutch province of Zeeland known as Zeeuws-Vlaanderen and in other Flemish communities around the world. The Flemings have their language in common with the Dutch, and thus remain relatively well aware of their northern neighbours with whom they have shared significant parts of their history. It is generally believed, based on historical linguistics, that the Flemings mainly descend from the invading Germanic tribes, rather than from the Gaulish tribes who lived in the same region before Roman times. At first sight, Flemish culture is defined by its West Germanic language, Dutch, as opposed to the language and culture of their mostly Francophone compatriots within Belgium.

The Flemish diaspora consists of Flemish emigrants and their descendants in countries such as France, the United States, Britain, Canada, Indonesia, Australia, South Africa and Latin America.

During the 15th, 16th and 17th centuries, when the

territory of present-day Flanders was the setting for an impressive economic and cultural boom, many artists and craftsmen sought to introduce their skills elsewhere, particularly in southern Europe. Flemish settlers introduced the first printing presses into Spain and Portugal. The Flemish contribution to the developing and populating of the Azores was so conspicuous that for a long time the archipelago was referred to as the Flemish Islands.

Following in the wake of the explorers, Flemish missionaries such as Pieter van Gent (1480-1572) in Mexico, Joos de Rijcke (1498-1578) in Ecuador, Ferdinand Verbiest (1623-1688) in China, Constant Lievens (1856-1893) in India, Pierre-Jean De Smet (1801-1873) in the United States, and Jozef de Veuster (1840-1889) in Molokai built a reputation in various overseas countries that continues even to this day.

A combination of a demographic explosion and inadequate economic growth resulted in an emigration from Flanders that started in the mid 19th century and continued up to the First World War. It was something that every family faced sooner or later. Not only did it involve the so-called lower classes of the population, but also non-lower-class people, who found a future overseas in teacher-training colleges and colleges of engineering and agriculture. Louis Cruis, for example, was a Flemish engineer who led expeditions to lay down the boundaries of Brazil and the city limits of the capital, Brasilia.

The destination of the majority of Flemish emigrants was France. There are an estimated 1,250,000 people with a Flemish surname in France. The Nord and Pas-

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de-Calais departments, however, were parts of historic Flanders before France annexed the region in 1656.

In the United States and Canada today, there are more than 1 million Americans who clearly have Flemish roots. In Michigan, the *Gazette van Detroit* is still published by Flemings in Dutch and English (Wikipedia, 2007).

To improve our knowledge of the paternal origins of the Flemish people, we undertook a population genetics study on a representative sample of Flemings. The resulting Y-STR data provide a means to estimate the frequency of the major Y chromosome haplogroups.

Methods

Buccal swabs were collected from 113 unrelated Flemish males, representing the alleged fathers from paternity cases. Flemish identity was determined by family name and place of birth. Informed consent was obtained, allowing us to use the data for population genetic studies, albeit anonymously.

DNA was extracted using the Qiaamp DNA kit (GreenSpooon et al, 1998). DNA was amplified using the Power Plex[®]Y kit following the manufacturer's instructions. This kit coamplifies 12 short tandem repeats (STR) of the Y chromosome, including the markers defined as the "European minimal haplotype" (Gill et al, 2001) (DYS19, DYS385 a/b, DYS389I, DYS389II, DYS390, DYS391, DYS392 and DYS393), plus two loci (DYS438 and DYS439) added to this panel by the SWGDAM (Lee et al, 2004), and DYS437. Amplification products were subsequently analysed by capillary electrophoresis on an ABI 3100 Genetic Analyzer (Mansfield et al, 1998). Alleles were named according to the recommendations of the DNA Commission of the International Society for Forensic Genetics (Bär et al, 1997).

For each of these 12-marker haplotypes, the corresponding Y haplogroup was deduced using Whit Athey's [Haplogroup Predictor](#) version 5 (2006).

Results

The table in the **Appendix** shows the 105 different 12-locus Y-STR haplotypes observed in the sample of 113 Flemings. Of these, 99 haplotypes occurred once, 4 haplotypes were counted twice, and 2 haplotypes were observed in three males.

Concerning the reliability of the haplogroup estimates, the Haplogroup Predictor yielded a median "score" of 67, with a standard deviation of 18. This implies a generally good "fitness" score. Indeed, values above 50

indicate a "good" fit, while values between 20 and 50 indicate a "fair" fit, according to the program's author. Using the Bayesian approach, *a priori* taking into account the northwest European origin of this population, the median posterior probability for the predicted haplotype is 100% (!), with a standard deviation of 5.6%. Another illustration of this issue is the fact that 95 of the 113 Bayesian haplogroup probabilities exceeded 99%.

Table 1 and **Figures 1 and 2** give the distribution of haplogroups in the sample of 113 Flemish men. The most frequent haplogroup, as is true for all of northwest Europe, is Haplogroup R1b—56.6% of the total. The next most frequent haplogroup at 19.5% was I1a, while third was I1b2a (formerly known as I1c), again in agreement with previous estimates in neighboring populations. Haplogroups E3b, G2, I1b1b, J2a1b, J2a1k, J2b, and L were observed in small numbers (representing 1-5% each). Haplogroups E3a, G5, H, I1b1 (x I1b1b), I1b2 (x I1b2a), J1, J2a1 (x J2a1b, J2a1k), K2, N, Q, and R1a were included in the analysis, but were not detected in the sample. Note that when the haplogroup count in a sample is observed or expected to be only a few, then there is little statistical significance in finding one, two, or three haplotypes in that haplogroup, or in not finding it at all in the sample. This may explain the fact that not a single case of haplogroup R1a was observed in this population sample of modest size.

Table 1 Distribution of Y-haplogroups in 113 Flemings

Haplogroup	Number	%
E3b	5	4.4
G2	4	3.5
I1a	22	19.5
I1b1	1	0.9
I1b2a	9	8.0
J2a1b	2	1.8
J2a1k	3	2.7
J2b	2	1.8
L	1	0.9
R1b	64	56.6
	113	100

Acknowledgement

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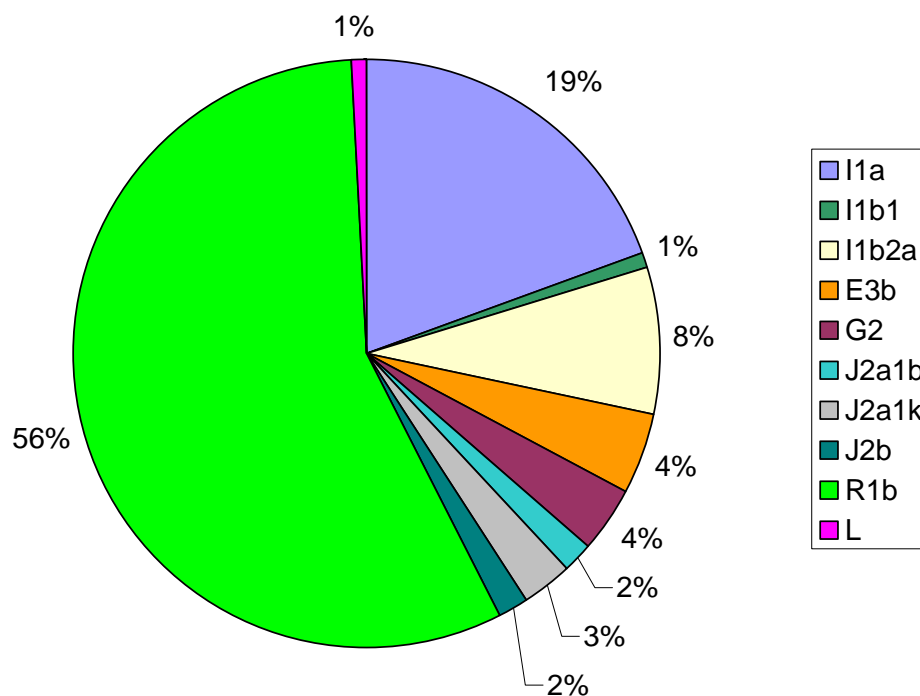


Figure 1 Graphical Representation of Haplogroup Frequencies from Table 1

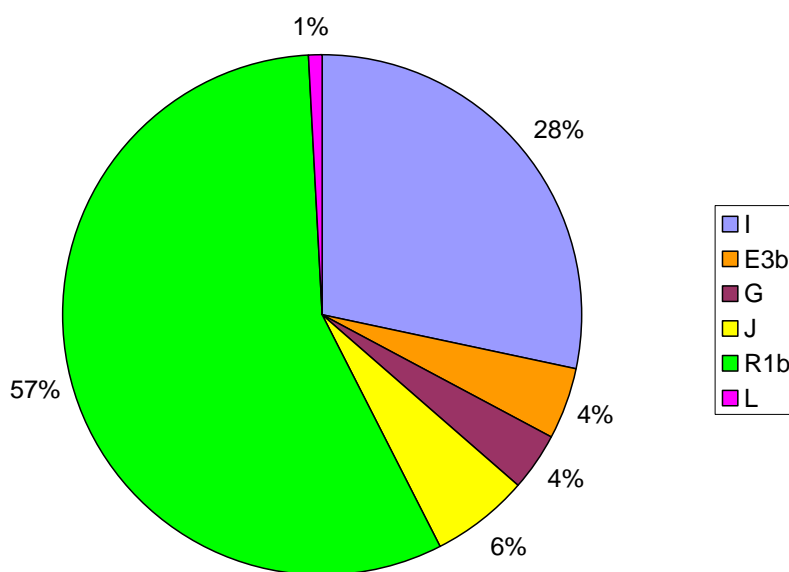


Figure 2 Distribution of Haplogroups Obtained by Lumping Together the Subclades of Haplogroups I and J

Electronic-Database Information

<https://www.hprg.com/hapest5/>

Haplogroup Predictor Program

References

[Athey TW \(2005\) Haplogroup prediction using an allele-frequency approach. J Genetic Genealogy, 1:1-7.](#)

[Athey TW \(2006\) Haplogroup prediction from Y-STR values using a Bayesian-allele-frequency approach. J Genetic Genealogy, 2:34-39.](#)

[Bär W, Brinkmann B, Budowle B, Carracedo A, Gill P, Lincoln P, Mayr W, Olaisen B \(1997\) DNA recommendations - Further report of the DNA commission of the ISFH regarding the use of short tandem repeat systems, Int J Legal Med 110:175-176.](#)

Flemish people (2007). In *Wikipedia, The Free Encyclopedia*. http://en.wikipedia.org/wiki/Flemish_people

[Gill P, Brenner C, Brinkmann B, Budowle B, Carracedo A, Jobling MA, de Knijff P, Kayser M, Krawczak M, Mayr WR, Morling N, Olaisen B, Pascali V, Prinz M, Roewer L, Schneider PM, Sajantila A, Tyler-Smith C \(2001\) DNA commission of the International Society of Forensic Genetics: recommendations on forensic analysis using Y-chromosome STRs. Int J Legal Med 114:305-309.](#)

[Greenspoon SA, Scarpetta MA, Drayton ML, Turek SA \(1998\) QIAamp spin columns as a method of DNA isolation for forensic casework. J Forensic Sci 43:1024-1030.](#)

[Lee D, Sims G, Newman J, Laad C, Smerick S, Barna C, Gross A, Butler J, Prinz M, Hartmann J, Kinsey P, Figarelli D, Ballantyne J \(2004\) Report on the current activities of the Scientific Working Group on DNA Analysis Methods Y-STR Subcommittee. For Sci Comm 6\(3\).](#)

[Mansfield ES, Robertson JM, Vainer M \(1998\) Analysis of multiplexed short tandem repeat \(STR\) systems using capillary electrophoresis. Electrophoresis 19:101-107.](#)

Appendix

Haplotypes of 12 Y-STR Loci in a Sample of 113 Flemish Males

Haplo type	n	DYS 19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393	DYS 437	DYS 438	DYS 439	Predicted Haplo- Group
H1	1	12	11, 14	13	29	23	10	13	13	15	12	13	R1b
H2	1	13	12, 15	13	29	22	9	11	13	14	10	12	<i>E3b</i>
H3	1	13	13, 14	14	30	24	9	11	13	14	10	10	E3b
H4	1	13	13, 17	13	30	24	10	11	13	14	10	12	E3b
H5	1	13	16, 17	13	31	24	10	11	13	14	10	13	E3b
H6	1	13	16, 18	13	30	24	10	11	13	14	10	13	E3b
H7	1	14	11, 11	13	29	25	10	13	13	15	12	13	R1b
H8	1	14	11, 12	13	29	23	11	13	13	15	12	12	R1b
H9	1	14	11, 13	13	28	24	11	13	13	15	12	12	R1b
H10	1	14	11, 13	13	29	23	11	13	13	15	12	12	R1b
H11	1	14	11, 13	13	29	24	11	13	13	15	12	10	R1b
H12	1	14	11, 13	13	29	24	11	13	13	15	12	12	R1b
H13	1	14	11, 14	12	28	23	10	11	13	16	10	12	I1a
H14	1	14	11, 14	13	28	23	10	13	13	15	12	11	R1b
H15	1	14	11, 14	13	28	24	11	13	13	15	12	14	R1b
H16	1	14	11, 14	13	29	23	11	13	13	14	12	12	R1b
H17	1	14	11, 14	13	29	23	11	13	13	15	12	12	R1b
H18	1	14	11, 14	13	29	23	11	13	14	15	12	12	R1b
H19	1	14	11, 14	13	29	24	10	13	13	15	13	13	R1b
H20	1	14	11, 14	13	29	24	11	13	12	14	12	11	R1b
H21	1	14	11, 14	13	29	24	11	13	13	14	12	11	R1b
H22	1	14	11, 14	13	29	24	11	13	13	14	12	13	R1b
H23	1	14	11, 14	13	29	24	11	13	13	15	12	11	R1b
H24	2	14	11, 14	13	29	24	11	13	13	15	12	12	R1b
H25	1	14	11, 14	13	29	24	11	13	13	15	12	13	R1b
H26	1	14	11, 14	13	29	24	11	13	13	15	13	13	R1b
H27	1	14	11, 14	13	29	24	11	13	15	15	12	11	R1b
H28	2	14	11, 14	13	29	25	11	13	13	15	12	11	R1b
H29	1	14	11, 14	13	29	25	11	13	13	15	12	12	R1b
H30	1	14	11, 14	13	30	23	11	13	13	15	12	11	R1b
H31	1	14	11, 14	13	31	24	10	13	13	15	12	11	R1b
H32	1	14	11, 14	14	30	23	10	13	13	15	12	12	R1b
H33	1	14	11, 14	14	30	23	11	13	13	15	12	12	R1b
H34	1	14	11, 14	14	30	24	11	13	13	15	12	12	R1b
H35	1	14	11, 14	14	30	25	11	13	14	14	12	13	R1b
H36	1	14	11, 14	14	31	23	11	14	13	15	12	13	R1b
H37	1	14	11, 15	13	28	23	10	13	13	15	12	11	R1b
H38	1	14	11, 15	13	28	24	11	13	13	14	12	12	R1b
H39	1	14	11, 15	13	29	23	11	13	13	14	12	12	R1b
H40	1	14	11, 15	13	29	23	11	13	14	14	12	12	R1b
H41	1	14	11, 15	13	29	23	11	14	13	15	12	12	R1b
H42	1	14	11, 15	13	29	24	11	13	13	15	12	11	R1b
H43	2	14	11, 15	13	29	24	11	13	13	15	12	12	R1b
H44	1	14	11, 15	13	29	24	11	13	13	16	12	11	R1b
H45	1	14	11, 15	13	30	24	11	13	13	15	12	12	R1b

Haplo type	n	DYS 19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393	DYS 437	DYS 438	DYS 439	Predicted Haplo- Group
H46	1	14	11, 15	13	30	25	10	13	13	14	12	12	R1b
H47	1	14	11, 15	13	31	23	11	13	13	16	12	12	R1b
H48	1	14	11, 15	14	30	24	10	14	13	15	12	13	R1b
H49	1	14	11, 16	13	29	23	11	13	14	15	12	12	R1b
H50	1	14	12, 13	14	31	24	10	13	13	15	12	12	R1b
H51	1	14	12, 14	12	28	24	10	13	13	15	12	11	R1b
H52	1	14	12, 14	13	28	23	11	13	13	15	12	11	R1b
H53	1	14	12, 14	13	29	24	11	13	13	15	12	12	R1b
H54	1	14	12, 14	13	29	25	11	13	13	14	12	11	R1b
H55	1	14	12, 15	13	29	25	10	13	13	15	11	12	R1b
H56	1	14	13, 13	12	28	22	10	11	14	16	10	12	I1a
H57	3	14	13, 14	12	28	22	10	11	13	16	10	11	I1a
H58	1	14	13, 14	12	28	22	10	11	13	16	10	12	I1a
H59	1	14	13, 14	12	28	22	11	11	13	16	10	11	I1a
H60	1	14	13, 14	12	28	22	11	11	13	16	10	12	I1a
H61	1	14	13, 14	12	28	22	11	11	14	16	10	11	I1a
H62	1	14	13, 14	12	28	23	10	11	13	16	10	11	I1a
H63	1	14	13, 14	12	28	23	10	11	14	16	10	12	I1a
H64	1	14	13, 14	12	29	22	10	11	13	16	10	12	I1a
H65	1	14	13, 16	13	29	23	10	11	12	14	9	12	<i>J2a1b</i>
H66	1	14	14, 14	12	28	22	10	11	13	16	10	12	I1a
H67	1	14	14, 14	12	28	23	10	11	13	16	10	11	I1a
H68	1	14	14, 15	12	28	22	10	11	14	16	10	12	I1a
H69	1	14	14, 15	13	30	24	11	14	13	15	12	12	R1b
H70	1	14	14, 15	13	31	25	11	13	13	15	12	12	R1b
H71	1	14	14, 16	13	30	24	10	11	12	15	8	12	<i>J2a1b</i>
H72	1	14	15, 15	14	32	23	10	12	14	14	10	11	I1b
H73	1	14	16, 16	11	27	23	10	13	13	16	10	11	L
H74	1	14	9, 14	13	29	23	11	13	13	15	12	11	R1b
H75	1	15	11, 13	13	29	23	10	13	14	15	12	12	R1b
H76	2	15	11, 14	13	29	23	11	13	13	15	12	11	R1b
H77	1	15	11, 14	13	29	24	11	13	12	14	12	14	R1b
H78	1	15	11, 14	13	29	24	12	13	13	15	12	12	R1b
H79	1	15	11, 14	14	30	24	11	13	14	15	12	11	R1b
H80	1	15	11, 14	14	31	27	11	13	13	15	12	12	R1b
H81	1	15	12, 16	13	29	24	9	11	12	14	9	12	J2a1k
H82	3	15	13, 14	12	28	22	10	11	13	15	10	11	I1a
H83	1	15	13, 14	12	28	22	10	11	13	16	10	11	I1a
H84	1	15	13, 14	12	28	22	10	11	14	16	10	11	<i>I1a</i>
H85	1	15	13, 16	13	29	24	9	11	12	14	9	11	J2a1k
H86	1	15	13, 18	12	29	24	10	11	14	16	10	11	<i>G2</i>
H87	1	15	14, 14	12	28	22	11	11	13	16	10	11	I1a
H88	1	15	14, 14	12	29	22	10	11	14	16	10	12	I1a
H89	1	15	14, 16	12	28	24	10	11	12	15	9	12	J2b
H90	1	15	15, 16	13	30	23	10	12	15	14	10	11	I1b2a
H91	1	15	15, 16	13	31	23	10	12	13	14	10	12	I1b2a
H92	1	15	15, 17	12	28	23	11	12	14	15	10	11	I1b2a
H93	1	15	16, 16	13	31	23	10	12	13	14	10	12	I1b2a
H94	1	15	16, 18	12	27	24	10	11	12	14	9	11	J2b

Haplo type	n	DYS 19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393	DYS 437	DYS 438	DYS 439	Predicted Haplo- Group
H95	1	15	17, 17	14	31	22	10	12	14	14	10	11	<i>I1b2a</i>
H96	1	16	11, 14	13	29	23	10	13	13	15	12	11	R1b
H97	1	16	11, 15	12	28	21	11	11	14	16	10	11	G2
H98	1	16	11, 16	14	30	23	11	13	13	15	12	12	R1b
H99	1	16	12, 13	12	28	22	10	11	13	16	10	11	I1a
H100	1	16	14, 14	12	29	23	10	12	15	15	10	10	<i>I1b2a</i>
H101	1	16	14, 17	12	28	22	10	10	14	16	10	12	G2
H102	1	16	14, 17	13	30	24	9	11	12	14	9	12	J2a1k
H103	1	16	14.2, 16	14	30	23	10	12	13	15	10	11	I1b2a
H104	1	16	15, 15	13	29	23	11	12	13	14	10	11	I1b2a
H105	1	17	12, 12	13	28	23	10	11	13	15	10	12	I1b1b

NOTE: It is sometimes difficult to distinguish G2 from I1a using this 12-marker set, and there were two haplotypes (H84 and H86) that could possibly be either G2 or I1a. One was called as G2 and one as I1a. Haplogroup predictions for haplotypes where the Bayesian probability was less than 90% (but all were greater than 60%) are shown in *red* and *italics*