

## ScotlandsDNA Announces the Results of the Red-Head Project



To coincide with the Redhead Convention to be held in Crosshaven, County Cork, Ireland, from Friday August 23rd to Sunday August 25th (check out the website for red-gistration and the likes of carrot-throwing competitions) and in the wake of the Ginger Pride march held during the Edinburgh Festival, we announce the result of a year long project to discover how red-headed Britain and Ireland are, and we publish the first ever map of the red-headed nations and regions.

It is based on recent ancestral data, the origins of the grandparents of 2,343 people. Our sample consisted of people with all four grandparents from either England, Scotland, Wales or Ireland. While some will have a few deeper ancestors from elsewhere, it is fair to assume that most of the genetic variants carried by someone with all four grandparents from Scotland are Scottish, including the red-head variants in the *MC1R* gene.

No-one needs a DNA test to tell if they have red hair. All they need is a mirror. What ScotlandsDNA set out to discover was a hidden story, one never before told. This is the story of the secret carriers.

Since red hair is recessive, children born with red hair need both parents to be carriers of one of the red hair gene variants. But millions of people in Britain and Ireland have no idea that they are carriers. Our project at last reveals just how red-headed a nation we really are. We looked at the three most common red-head variants of the *MC1R* gene.

These are;

Cysteine-red (or R151C)

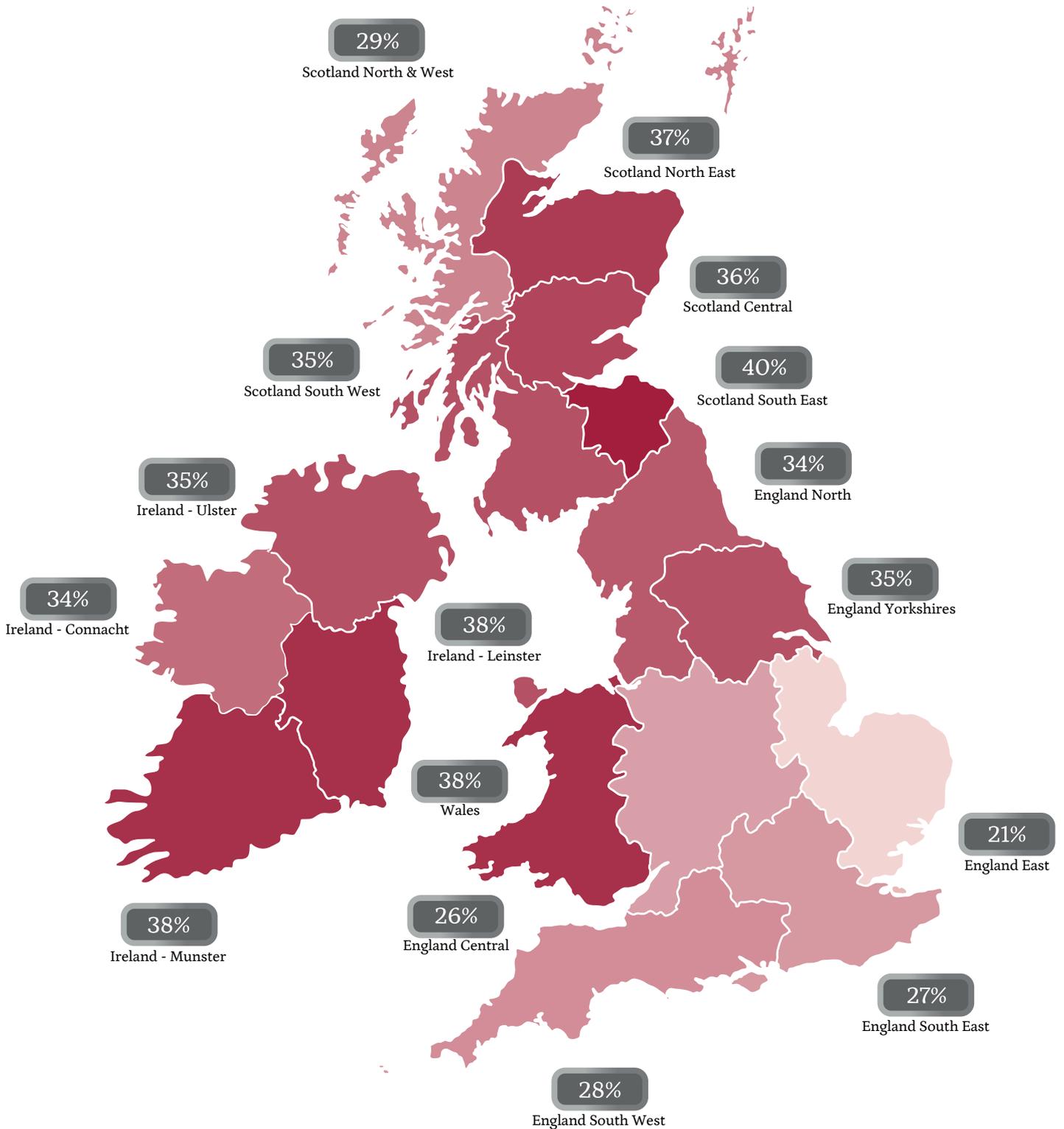
Tryptophan-red (or R160W)

Histidine-red (or D294H)

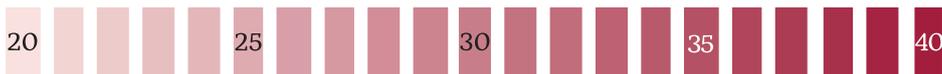
There are other, much rarer variants. If both parents are carriers of a red hair gene variant, there is a 25% chance that their offspring will have red hair. This is called recessive inheritance. Everyone who carries one of the variants is a direct descendant of the first person ever to have it. Those with 151-Cysteine-red have a 70,000 year old variant that probably arose in West Asia, those with 160-Tryptophan-red are the descendants of someone who probably also lived in West Asia 70,000 years ago, and finally 294-Histidine-reds belong to a much younger group who descend from a European who lived about 30,000 years ago.

Here are some headlines;

1. The most red-headed part of Britain and Ireland is the South-East of Scotland with Edinburgh as a red-hotspot. 40% carry one of the three common red hair gene variants.
2. Scotland as whole has a higher percentage than Ireland, 36.5% as against 34.7%.
3. Wales is higher than Ireland with 38% - so some preconceptions of the Irish as the most red-headed nation are being reorganised.
4. But the big surprise is England as a whole with 32.4% and that skewed significantly towards the north of England and Yorkshire/Humberside with 34.4% – very similar to Ireland. East Anglia is by far the lowest at less than 21%, while in the Midlands 26% are carriers.
5. The number of people in Britain and Ireland who are carriers is very large indeed. We estimate a total of 20.4 million people are carriers of the red hair variants. That should help play down ginger jibes.
6. The percentage of red heads is lower but also varies, with about 6% of Scots having red hair, about 300,000. About 4% of English are red-heads, around 2.1 million people.



Percentage of ancestral populations



Why does Britain and Ireland have so many carriers and red-heads? One hypothesis is linked to vitamin D. Red hair and lighter skin tone are related and in an archipelago where the sun shines less than in continental Europe, we can absorb more because of that. But if that were true then the cloudier parts of Britain and Ireland, in the west, would have the highest percentages.

Perhaps migration provides an answer. The Northern Isles, the Hebrides and the Atlantic coastlands saw significant Viking incursions and settlement after c800AD, and in the south east of Britain, the Anglo-Saxons settled in numbers after c400AD. These in-migrations may have significantly diluted the red-hair variants present in the indigenous populations before those dates.

Perhaps sexual selection is a potential reason – that having red hair, although not helping survival, was considered sexually attractive, and thus redheads had more children than non-redheads, leading to an increase in frequency. Like the peacock's tail, it doesn't help him survive but it attracts mates, hence the genes are passed on.

Or perhaps Tacitus was right. The Roman historian wrote the *Agricola*, an account of his father-in-law's governorship of the province of Britannia in the 1st century AD. Tacitus supplied the first recorded descriptions of the Caledonians and their rainy country. He noticed that many of them had 'red-gold' hair. Perhaps not much has changed in 2,000 years.

### About this research.

The summed allele frequencies of the following *MC1R* variants are used – R151C, R160W and D294H.

The Hardy-Weinberg expectations of the carrier frequencies are given ( $2pq$ ), on the basis of the estimated summed allele frequencies.

There are various other red-head variants, but all are rare with an allele frequency below 2%. Therefore these estimates are minimum figures, which could rise by a few % if all rare red-head variants were included.

The regional figures are estimates based on samples of over 100 alleles in all cases apart from England E, England SW, Wales and the Irish regions, the frequencies of which should thus be treated as preliminary. The Scotland vs England figures are based on about 2000 alleles each.

To add to this research, ScotlandsDNA is continuing the study further, searching for carriers of the rarer red-head gene variants through Chromo2, our latest, state-of-the-art gene chip which tests for all known red hair variants on the *MC1R* gene. Once completed, we will release the results. We expect the number of carriers to be even higher.

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### Notes to Editor:

Launched in November 2011, ScotlandsDNA immediately set out to innovate. By combining historical analysis with the genetic information that can be gleaned from testing for ancestral DNA, we aimed to achieve a new understanding of Scotland's history – a people's history.

A commercial company closely involved in scientific research, ScotlandsDNA offers a unique package of information featuring thorough historical analyses of results currently unmatched by any other European DNA ancestry testing company.