THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Health, inequality and the politics of genes

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Abstract

Research into the possible genetic basis of health inequalities between different ethnic or racial groups raises many scientific, ethical and political concerns. Proponents of such research point to the possible benefits for marginalised groups of understanding genetic influences on health outcomes; opponents indicate the potential social costs, citing historical use of Darwinian concepts to explain and justify inequalities between different peoples. Many health researchers may avoid the subject due to its potential for controversy—e.g. the recent media furore over the so-called 'warrior gene', and its apparent genetic explanations for negative health and social statistics among Māori. This article argues for a more nuanced account of the evolutionary history of marginalised groups such as Māori, one that accepts the possibility of relevant genetic differences between sub-populations, but which also acknowledges genuine ethical and political concerns. Such an account may assist health researchers in addressing the politically sensitive subject of 'race' and social inequality.

That health inequalities exist between ethnic or racial sub-populations in New Zealand is incontrovertible; according to recent figures, for example, the average life expectancy of Māori is 8 years shorter than non-Māori.[1] Explaining these inequalities is problematic, especially given the correlation with other social disparities (e.g. wealth, education), and the consequent need to consider poverty, deprivation and, in the case of Māori, the potential effects of a century and a half of colonisation.

Historically, of course, another explanation was often advanced for the obvious inequalities between different peoples: that this was simply the survival of the fittest, in the Darwinian struggle for existence. Indeed, Darwin himself used the declining Māori population in the 19th Century to illustrate the seemingly inevitable fate (i.e. extinction) of 'less-favoured' human races.[2]

Recent genetic research (notably, in New Zealand, the so-called 'warrior gene' and its reputed link to violent behaviour among Māori) has raised concerns that these discredited social Darwinian theories may be resurrected in modern genetic guise.[3]

By contrast, some biomedical researchers have argued that failure to acknowledge genetic differences between sub-populations may prove detrimental to the health and well-being of minority groups such as Māori.[4] Scientific and ethical reservations about the original 'warrior gene' research are widespread.[3,5,6] Little attention, however, has been paid to how health researchers could or should approach a topic as politically fraught as this; the possibility that genetic differences between sub-populations may have health or social consequences. Indeed, many health professionals may choose to simply avoid the subject due to its potential for controversy, and thus fail to provide valuable input into the social and political debate on the causes of health inequalities; debate that, in turn, frames possible policy responses to these inequalities.

This discussion will address the key questions: is an evolutionary approach to health inequalities likely to be of benefit to marginalised groups such as Māori? And: do we have reasonable grounds for concern about any such approach?

Both questions will be answered, with qualifications, in the affirmative. This will then allow a range of suggestions for how biomedical and health researchers may best deal with the politically sensitive subject of 'race' and social inequality. One major conclusion will be that an overly simplistic view of evolutionary theory (and genetics) is often presented in the debate.

A more nuanced understanding of Darwinian theory, especially of gene-environment interaction and the effects of historical-cultural processes, may prove beneficial in both improving health outcomes for marginalised groups and in allaying the fears of those who remain suspicious of Darwinian interpretations of human behaviour.

Human sub-populations or 'races' differ phenotypically; in skin colour, hair texture or facial features. One of the most contentious issues in the human sciences (indeed, in science and politics generally) is whether such differences go deeper than these observable physical characteristics—to behaviour, say, or to cognitive abilities.[7–9] An apparent consensus view among social theorists holds that human races are not biologically real, with some theorists arguing further that 'race talk' should be eliminated entirely from public discourse.[10–12] Research that openly challenges this majority opinion on race is subject to severe censure.[13]

This emphasises the fact that 'race' is a contested concept, and that it carries with it a great deal of historical baggage; most especially, the folk-biological beliefs used to justify racial bigotry.[10,12,14] A less-loaded alternative, such as 'ethnic group', is therefore often preferred. Nevertheless, race and ethnicity are not always synonymous, and a biological concept of race is sometimes of pragmatic value.

In New Zealand, for instance, identifying the 'race' of older human remains (e.g. those possibly from pre-European burial sites) may have cultural significance for Māori , due to spiritual links to ancestors;[15] at the same time, actual biological ancestry is integral to the cultural concept of whakapapa, or lineage. In such contexts, then, the physical/biological associations of 'race' may overlap with the social/cultural associations of 'ethnicity'.

In addition to possible inadvertent conflation of concepts such as race and ethnicity, a discussion such as this runs the risk of portraying minority groups, such as Māori , as 'Other'; for example, those who seemingly vary 'abnormally' from the majority population.

By contrast, genetic explanations for the high rates of melanoma among Pākehā (non-Māori) New Zealanders, for example, would be considered unremarkable; thus, while the focus here is primarily on the evolutionary genetics of Māori , it is important to acknowledge that evolutionary genetic reasoning applies to all population sub-groups. (The relative size of these sub-groups is also a factor; genetic traits associated with a small number of Pākehā families, for example, may be concealed within the larger Pākehā population; traits associated with a similar number of Māori whānau, however, may skew genetic data within the comparatively smaller Māori population.)

To return to the wider question of human difference, then: at an extreme, the consensus view on race suggests that no important differences exist between human sub-populations. Substantial medical evidence, however, links certain ailments with specific sub-groups: Sickle-cell anaemia (and partial immunity to malaria), for example, indicates West African heritage; Tay-Sachs disease is restricted almost exclusively to those of Ashkenazi Jewish descent; lactose intolerance is a feature of some sub-populations but not others; and genetic ancestry is relevant to the success or otherwise of organ transplants.[14]

Genetic information on human group differences is accumulating rapidly. However, genetic research into, say, group differences in medical conditions could appear to be at one end of a slippery slope; if biochemical differences exist between sub-populations, why not behavioural differences? And if sub-populations differ behaviourally, could racial inequalities be explained in simple genetic terms? For example, could we put the high rates of violent offending in Māori communities down simply to 'warrior genes'? Or obesity to 'thrifty genes'?

According to recent media reports, this is exactly what genetic researchers have suggested; that, say, "Māori are genetically wired to commit acts of violence". [16-17] This highlights genuine concerns about the socio-political implications of genetic research. If simplistic genetic explanations for complex social issues become established in the public mind—for example, the belief that Māori are inherently and ineluctably violent—then political support for ameliorative social policies could be eroded. Why waste taxpayer dollars on problems that cannot be fixed?

Two contrasting views are apparent among those researchers who accept the likelihood of meaningful genetic differences between human sub-populations: That the potential for social harm arising from genetic investigations are such that we may be better off abandoning these lines of enquiry altogether;[18] or that scientists' only responsibility is to the truth, no matter how politically unpalatable that truth may turn out to be.[19] Medical and health science appears caught between these two extremes.

On the one hand, health intervention that disregards possible evolved or genetic differences between sub-populations also risks ignoring factors that may help improve people's lives. On the other hand, if genetic or evolutionary research is likely to revive racial stereotypes, or cause people to view between-group inequalities as unchangeable, then the potential for wider social harm may outweigh the more restricted health benefits. How then could or should health practitioners best deal with the various scientific, political and ethical aspects of a Darwinian approach to group difference?

The 'warrior gene' controversy, which first erupted in 2006 [4,16] and re-ignited in late 2009,[3,20] illustrates the social cost/benefit dilemma posed by human genetic research. The research itself focused on monoamine oxidase (MAO) genes; those apparently linked to various behavioural disorders, including depression, mental retardation and aggression.[3,4]

A gene sub-type, MAO-A, had earlier been dubbed the 'warrior gene' due to its apparent association with aggressive behaviour in Rhesus macaque monkeys,[5] and this label was subsequently applied to the equivalent gene polymorph in humans, in relation to evolutionary speculation about its apparent prevalence among Māori

males.[21] In August 2006, this was reported in the popular media as a claim that contemporary Māori carry a 'warrior gene', making them prone to violence, criminality and risky behaviour.[16]

However, according to the epidemiologists at the centre of the controversy, Rod Lea and Geoffrey Chambers, their research agenda focussed not on aggressive traits in Māori but on the association between MAO-A and addiction; in particular, the relationship between ethnic variation in MAO-A frequency and differential patterns of alcohol and tobacco dependence. Their interpretation of the genetic data indicated that the frequency of the relevant allele was almost twice as high among Māori as Caucasian males.[4] This interpretation of the data, and in particular the small sample upon which Lea & Chambers' extrapolations were based, has been extensively criticised,[3,5,6] and the purpose here is not to legitimise this particular study.

Instead, the focus is on the medical question: could genetic information on alcohol/tobacco dependence be used in developing more appropriate treatments and better health outcomes for Māori? If so, this would illustrate one side of the dilemma suggested above: That genetic research may have positive health benefits for marginalised groups such as Māori. How then, with regard to the Lea & Chambers' study, did this benign-seeming aim become politicised?

In providing an evolutionary explanation for the apparent higher frequency of MAO-A in modern Māori, Lea & Chambers developed a 'warrior gene hypothesis', speculating that the gene may have been positively selected during the ocean voyaging and inter-tribal wars that supposedly characterised the ancestral Polynesian migrations across the Pacific. They supported this hypothesis by arguing that Māori martial prowess was historically well-recognised and that "reverence for the 'warrior' tradition remains a key part of Māori cultural structure today".[4]

While Lea & Chambers denied that this provided a biological explanation for present-day social dysfunction, their argument implied that Māori had evolved in a manner that made them genetically (and behaviourally) different from other populations. Again, the historically- and politically-dubious nature of this speculation has been emphasised in critical reviews.[3,5,6] The relevant point here is the implication that Māori are in some way inherently more aggressive than non-Māori. This illustrates the other side of the genetic difference dilemma: That any such conclusion may have a deleterious social or political impact on efforts to address high levels of violence in Māori communities.

An epidemiological study into the MAO-A30bp-rp variant, its associations with tobacco and alcohol dependence, and the variation in this gene allele's frequency between different ethnic groups would probably excite little media or political controversy, while still providing useful information for the design of diagnostic, preventative or treatment regimes. Much of the furore surrounding the Lea & Chambers' hypothesis, therefore, appears due to use of the attention-grabbing term 'warrior gene'.

For the public to believe that Māori carry a 'warrior gene' is, potentially, socially harmful; accepting the possibility of some genetic influences on tobacco/alcohol dependence among Māori appears less so. Nor is it here immediately obvious why an evolutionary explanation for apparent differences in gene frequency is necessary.

From a health perspective, the (apparent) fact that such differences exist is the relevant issue. With hindsight, or in relation to future studies, such considerations should be taken into account.

At the same time, however, an evolutionary perspective may be illuminative. A fuller understanding of the ancestral Polynesian migrations across Asia and into the Pacific may provide important insights into contemporary Pacific peoples' health and social well-being. For example, can we use commonalities/dissimilarities in health outcomes to more fully understand the causes of rising diabetes rates among disparate Pacific peoples (which appear due mainly to social and cultural factors)[22] or differences in cancer prevalence (which may combine cultural and genetic factors)? By its very nature, an evolutionary or genetic approach to human health conditions is reductionist; an attempt to describe aetiologically complex phenomena (such as behavioural conditions) in terms of other phenomena, at a simpler or more fundamental level (e.g. gene expression).

While such reductionism is necessary to distinguish possible underlying causes of observed health outcomes, it may bring with it a tendency to over-simplify human evolutionary processes, or to merely pay lip-service to the inter-relationship between genes, environment and culture. The 'warrior gene hypothesis', for example, conflates behavioural traits (risk-taking and aggression), historical-cultural practices (the supposed Māori warrior tradition) and contemporary social facts (health and social inequalities). Nonetheless, a more nuanced Darwinian approach could reveal useful insights into contemporary health and social issues, and highlight areas where evolutionary or genetic ideas may complement rather than challenge more standard sociological explanations for health or status inequalities.

The title of author Alan Duff's *Once Were Warriors* epitomises an intuitive (but suspect) notion that violence in contemporary Māori communities is a legacy of the historical Māori warrior culture. The 'warrior gene hypothesis' similarly reflects this notion, by pointing to possible genetic influences on the development of this historic culture,[4] and thereby implying a genetic basis for modern social dysfunction.[3] This, in turn, also suggests genetic determinism; that naturally selected behavioural traits have been responsible for shaping later cultural developments or present-day social behaviour. Is it the case, then, that evolutionary accounts of human behaviour inevitably imply some form of genetic determinism, the notion that humans (or distinct human groups) are, to some extent, pre-programmed to behave in certain ways?

In the case of Māori, evolutionary theory would certainly predict that genetic bottlenecks (such as small founding populations) and selective pressures over the millennia could have uniquely moulded the Māori genome. For example, it is plausible that personality traits (such as those described by the inadvertently apt acronyms OCEAN or CANOE: Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) may have a statistical distribution among Māori that differs from other sub-populations.

Those spear-heading each new migration (such as that to Aotearoa/New Zealand), for instance, were possibly less risk-averse than those choosing to stay behind; indeed, this is perhaps true also of later Pākehā colonists, with the supposed Kiwi 'can-do' attitude potentially arising from the greater openness and resourcefulness of the early

pioneers. Thus it is conceivable that certain behavioural or personality traits, concentrated in the initial founding populations, may have influenced the development of any subsequent cultural psyche.

This argument, though, can be qualified with reference to MAO-A. As this gene has been linked to risk-taking behaviour, it initially appears plausible that it was positively selected during the Polynesian expansion across the Pacific—hence the gene's apparent frequency among Māori. In the relevant studies, however, the highest frequencies of the so-called 'warrior gene' are not found among Māori but, rather, among Chinese males.[4] This could immediately cast doubt on the evolutionary speculation behind the 'warrior gene hypothesis'.

Alternatively, one could speculate that, just as risk-taking traits may have proved advantageous in island-colonising ancestral Polynesian environments, so too may they have been in the different environments faced by ancestral Chinese. In a modern context, certainly in New Zealand, risk-taking traits may continue to be advantageous in the commercial settings stereotypically associated with Chinese; in an economically-deprived environment, stereotypically associated with many Māori, these self-same characteristics may prove disadvantageous, especially if they are expressed in drug-taking, alcohol abuse or criminal behaviour. The social consequences of such traits (if any exist) are contingent on environment.

Furthermore, the 'warrior gene hypothesis' is premised on the notion of positive selection of advantageous behavioural traits. In the successful Polynesian expansion across the Pacific, such traits would undoubtedly have included altruism/self-sacrifice, loyalty and intense cooperation. Paradoxically, these same traits also underlie another ultra-social human behaviour: warfare. Yet while intra-group cooperation is intrinsic to all human societies, inter-group conflict is a latent (but not an inevitable) human response to scarcity of, or competition for, resources. Māori cultural developments in New Zealand illustrate this.

In the period following the initial founding migration(s), cultural practices reflected changing ecological pressures, as the early Māori colonists adapted to the large and resource-rich landmass of New Zealand. The tribal culture most popularly associated with the Māori warrior tradition developed later, in the 15th and 16th Centuries, possibly as a result of population growth and exhaustion of initial food sources (e.g. large bird species such as moa).[23] Tribal organisation allowed more diverse and intensive extraction of resources, including hostile competition with other groups. Thus, while evolved behavioural traits may have influenced the resultant Māori culture, inter-tribal conflict (and the so-called warrior tradition) is more appropriately explained as a cultural response to environmental conditions.

In addition, while the specifics of any Māori warrior tradition are unique, the behaviour is not; tribal conflict is common to most (if not all) human cultures. For example, the earliest plausible date for the arrival of Māori in New Zealand, around 1000 AD, was contemporaneous with the Viking and Norman invasions of Britain; and this only centuries after the Anglo-Saxon warrior society first became established in the land that now bears its name, England (i.e. at roughly the same time that ancestral Polynesians established themselves in Hawaii and Easter Island).[24]

Thus the first Europeans to land in New Zealand, the British seaman under James Cook, were as much heirs to a warrior tradition as were the indigenous peoples with whom they came into contact. It is worth noting that Cook's British government was then engaged, closer to home, in subduing the warlike Scottish Highlanders and the Irish, both of whom were still regarded as distinct 'races' in Darwin's time.[2]

To reverse the genetic gaze away from Māori, beneath the apparent homogeneity of the Pākehā population potentially lurks genetic variation traceable to distinct sub-populations in the British Isles or elsewhere in Europe. The point is that, while the Māori society first encountered by Europeans appeared to be a warrior one, so too were contemporary or near-contemporary European societies; why then does it seem appropriate to posit simplistic genetic explanations for the former (i.e. Māori) culture but not the latter?

Nevertheless, Europeans did have one crucial genetic advantage over Māori: partial immunity to disease. Evolutionary theory explains this fact. Infectious diseases had been endemic for thousands of years in the densely populated societies of Eurasia; thus genetic changes in body chemistry that increased immunity to disease were under strong selective pressure in European populations, but not in less dense indigenous populations, such as in pre-contact New Zealand.[7] The effects of these basic genetic differences were catastrophic for indigenous peoples. Darwin, for example, described disease as one of the main causes of the "notorious" decline in the Māori population in the 19th Century, such as an estimated 33 percent fall in Māori numbers in the decades after 1850.[2]

The social dislocation wrought by this rapid population decrease must have been equally devastating (by analogy with the more well-reported influenza pandemic in Samoa in 1918,[25] those most susceptible to these diseases were Kaumatua, tribal elders whose leadership skills were likely to have been lost at precisely the time they was most needed). While such 'fatal impact' interpretations of post-contact New Zealand history are open to debate,[26] a good starting point for any evolutionary/genetic explanation for observed social inequalities between Māori and non-Māori in modern New Zealand could be with (the historical consequences of) evolved resistance to disease: A negative feedback of dramatic population decline, weakening social cohesion, adoption of European vices (alcohol and tobacco), and increasing marginalisation as European colonist numbers grew.

Evolutionary and genetic factors are, therefore, potentially relevant to contemporary health issues. On analogy with evolved immunity to disease, there may well be genetic differences in alcohol or tobacco tolerance between sub-populations (including sub-groups within the Pākehā population). Relevant genetic research, therefore, could assist attempts to address the health and social consequences of, say, drug dependence. A proviso here is that, while reductionism could indicate the possible genetic basis for behavioural traits, any appropriate conclusions could only be draw in reference to higher level cultural and historical phenomena. A broader genetic, cultural, historical approach is therefore necessary to fully understand the causes of different health and social outcomes for different peoples.

Sociological explanations for the health and social inequalities faced by groups such as Māori highlight poverty, deprivation and the impact of colonisation. This is not incompatible with an evolutionary approach. The environment in which the genome

develops, and in which any genetic influence is expressed, is of paramount importance. A broader perspective on Māori evolutionary history, for example, indicates that the Māori genome has not determined cultural and social development, rather it has allowed flexible responses to changing environmental conditions. Yet for the past 160 years, Māori have been marginalised; the resultant deprived environment, then, is the one in which (possible) genetic influences have been and are being expressed.

Popular (mis)interpretations of the results of genetic research, however, have the potential to erode support for ameliorative social policies. Awareness of these issues, and of the need to provide a broader cultural and historical perspective, may allow gene-based health research to avoid the political pitfalls highlighted by the 'warrior gene' controversy. Political opposition to genetic research, too, may be misplaced.

Whether the negative social outcomes of groups such as Māori are the result solely of environment, or of a combination of environmental and genetic factors (as seems increasingly likely), our health and social goals remain the same: Improving these groups' social and economic situation.

Competing interests: None known.

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