

Home DNA test kits cause controversy

The availability of home DNA test kits that promise to reveal disease risks has mushroomed in recent years. But concern about the predictive value of such tests and their use outside of clinical settings have led to their ban in some European countries. Priya Shetty investigates.

In 2006, Steve Cross was on a mission. The then curator of the UK Wellcome Trust's permanent collection wanted to investigate how much personal genetic information he could find out about himself armed with just a credit card.

Cross was able to embark on this quest because of the plethora of home DNA testing kits that have mushroomed worldwide in the past few years, promising to reveal a variety of disease risks from stroke to obesity. Many of these "lifestyle" tests are unregulated, however, and several scientists say too little is known about the risks for complex diseases to offer meaningful information. The manufacturers counter that people have a right to know their own genetic information, however patchy that knowledge might be at this moment. Concern that the tests might provoke needless health concerns if done outside a clinical genetics setting have led to a ban on private tests in some European countries, and there is a simmering debate worldwide about whether the tests should be sold.

A key factor in making these tests possible is the scientific behemoth of the Human Genome Project. The completion of the sequence in 2003 had major implications for finding disease genes. Many of the gene mutations behind single-gene disorders such as Huntington's disease had already been pinpointed, but the genes that influenced more common complex diseases were largely a mystery.

The Human Genome Project also produced a catalogue of single nucleotide polymorphisms (SNPs). These are the result of errors in DNA copying and the presence of some variations seem to predispose people to complex diseases or alter their response to a

drug. Although our understanding of susceptibility genes has advanced, many agree that the interaction between genes and the environment is complex.

Nevertheless, the past few years have seen the launch of two high-profile

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DNA-testing companies: deCODEme and 23andMe. Both companies use SNP analysis to gauge genetic risk factors for diseases like heart disease, Alzheimer's, and breast cancer (although rather than testing for the main breast-cancer susceptibility genes, *BRCA1* and *BRCA2*, the SNP method looks at lower-risk genetic variants, such as in the *MAP3K1* gene on chromosome 5).

The Human Genetics Commission (HGC), the UK government's genetics advisory body, has several objections to the unregulated sale of direct-to-consumer tests, and last December called for an urgent review of the

regulatory framework. The key concern, says co-author of the report Christine Patch, is that the public may be misled about the predictive value of the test. For most people, says the agency, non-genetic factors such as smoking, diet, and exercise will be far more likely to put people at risk of say, heart disease, than any inherited genetic susceptibility.

Teri Manolio, director of the US National Institutes of Health's Office of Population Genomics, agrees that although the hope is that these tests will eventually offer clinically useful information about complex diseases, "the studies haven't yet been done to demonstrate this".

The head of deCODEme, Kari Stefánsson, disagrees. "The risk assessment you get is definitive", he says. "The studies that have been done to look for genetic risk factors are incredibly large—we are looking at tens of thousands of people, and there is not a single test in the health-care system in Britain and elsewhere today that was introduced after as thorough a clinical validation". He admits that we do not know all the factors that



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Whether people alter unhealthy behaviours in light of genetic risks is unclear

cause complex disease but asks “when are we going to know everything?”

Theresa Marteau, professor of health psychology at King’s College London, points out that understanding risk factors does not necessarily translate into a change in behaviour as anyone who has ever tried to quit smoking or lose weight will know. So do the companies know whether people use the information to change their behaviour, and if not, are the tests of any value? Stefánsson resents this “utilitarian view of the individual”. “It can be meaningful and useful for you to know about [your health risks] even if you do not do anything about it,” he says. Alex Coonce at 23andMe has had “anecdotal feedback that people who appear to have higher genetic risk for type 2 diabetes, for example, are more aware of their diets”. He says the company’s tests are for “informational purposes only” and acknowledges there is a “significant environmental component which also plays a role”.

Currently, the tests fall into the grey area between regulated medical tests and unregulated “lifestyle” tests, and the HGC are calling for better consideration of how these tests are regulated and, indeed, whether they should be sold straight to consumers at all. Some European countries such as France and Switzerland have banned private genetic testing altogether. The HGC itself does not advocate a ban—Patch says “draconian” approaches

would probably be useless given that prohibition has not curbed sales of other products, whether medicines or music downloads, over the internet.

Olivier Guillod, director of the Swiss Health Law Institute admits that the Swiss ban is “probably ineffective against internet sales”. But, he says, banning private genetic testing “makes it easier to educate people and to sensitise them to the risks of making a genetic test without proper counselling. Health professionals also play a crucial role in that effort. That is why one could argue that other European countries should consider introducing a similar ban”.

Given the complexity of the information that SNPs provide, another concern is whether people with no specialist scientific knowledge will be able to interpret the results. Coonce says customer queries tend to be “about the navigation of the site, rather than confusion about interpretation of the data”. Companies vary widely in the quality of information they provide but Steve Cross says on the whole, the guidance he received was insufficient to make sense of, or an “information overload” despite having a genetics PhD.

The companies are clearly aware of the ethical quagmire they are treading in—several, including deCODEme, have prominent disclaimers on their websites that they do not claim to be clinical diagnostic services (although slightly contradictorily, in a telephone conversation, Stefánsson insists that they “do sell diagnostic tests” since they are “diagnosing the risk of” specific diseases). Some of the companies say they require a doctor’s referral, and several probably uphold that claim, however, says Cross, whenever he was asked to name his referring physician, he simply wrote his own name (Cross is not a medic) and was never refused a test.

Marteau, however, cautions against the assumption that consulting a specialist “leads to any better understanding than a well written piece

of paper”. She cites the example of antenatal care, for which, despite plenty of “testing and face-to-face consultation”, there is “quite good evidence that [key information] is not well communicated”.

Although Cross was happy to find out “pointless bits of information about himself” he takes his newfound genetic knowledge with a “huge pinch of salt”, not just because of the lack of regulation, but also because two identical tests from different companies gave conflicting results. And, however clearly the results are explained, how people will process results that show only slightly raised risks remains to be seen.

And, if negative health information makes someone rethink the number of hamburgers they eat, would seemingly positive information have an opposite effect? For example, might test results that indicate an individual’s metabolism deals well with alcohol make them less careful about their drinking? Colonoscopy and mammography “are very effective screening methods” for many cancers, says Manolio, but “assuming you no longer need to follow standard screening guidelines solely because of a negative test for [cancer-related] variants could have tragic consequences.”

But Marteau says that how people respond to scientific information, particularly from genetic sources, is not clear, and it may not tally with scientists’ expectations: “looking at the evidence we have so far, it seems it is relatively difficult to make people very anxious from susceptibility testing”; it’s more “the concern is that they do no good except empty people’s pockets”. She is joining a fledgling academic collaboration with some of the companies offering private gene tests to investigate the effect of these tests. “My bottom line is that all of this needs to be researched otherwise we are dancing in the dark”, she says.

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