



23andMe

FDA Molecular and Clinical Genetics Panel of
Medical Devices Advisory Committee

Public Meetings, March 8 & 9, 2011

Docket No. FDA-2011-N-0066

Ashley Gould
General Counsel

I'd like to start by thanking the FDA and this panel specifically for the opportunity to share our views and experiences with Direct-Access Genetic Testing.

23andMe is excited about the future of genetics and the opportunity to work with a wide variety of agencies, organizations, and the medical community at large to establish the regulatory and functional frameworks that will ensure consumers and healthcare professionals are able to access genetic information in a manner that is clear, useful and engaging.

Today, I'm going to cover 23andMe's position on policy and regulation including our requests for this panel's consideration. Tomorrow, you'll hear from my colleague, 23andMe's Senior Director of Regulatory Affairs and Quality Assurance, Rose Romeo, who will provide more detailed and technical information related to our requests.

23andMe has been proactively collaborating with the FDA for more than a year and we believe we have a clear path to pursue and obtain FDA approval of our entire genetic testing platform, though the process will take time to complete. Today's conversation and this panel's findings will serve to inform our path as we move forward.



Topics

- Delivering Information: Analytical & Clinical Validity, Analytical Standards and Transparency
- Putting People First: The Rights of the Public, Patients and Physicians
- (The Impossible Task of) Addressing Fear
- The Benefits of Direct-Access Genetic Testing
- Policy & Regulation: The Essential Elements
- Requests for Consideration

Today, I'll be sharing our views on the following topics...



Delivering Information: Analytical Validity & Standards

- Successful Regulation for All Genetic Testing Services Should Start With the Following:
 - ✓ Robust Analytical Performance Standards
 - ✓ Sound and Reliable Methodology for Technology Platforms
 - ✓ Transparency in Presentation of Results

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The basis of what every Genetic Testing Service provides is information. It is critical that the information be as accurate and reliable as possible. The information must also be presented in a manner that is clear and transparent so that it is easy for everyone – physicians, patients and people -- to understand not only what the information can tell them, but also what it can't.

We have already established comprehensive performance standards and we continually work towards improving them. We also believe that our choice in partners is critical in establishing and maintaining high quality standards, which is why we have continued to utilize the Illumina technology, which we find best in class, and also why we have a strong partnership with National Genetics Institute, a CLIA certified laboratory where clinical genetic testing is frequently and routinely done, to conduct all of our testing.

23andMe believes that the regulatory framework for all genetic testing companies should start with clear and robust analytical performance standards.



Delivering Information: Clinical Validity

- New Definition of Clinical Validity Specific to Genetic Testing is Needed
- To Develop Definition, Convene Collaborative, Cross-Sector Working Group
 - ✓ Various Government Agencies
 - ✓ Professional Healthcare Provider Associations/Organizations
 - ✓ Academic Researchers
 - ✓ Private Industry

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It is also important to look at the evolving state of clinical validity for genetic testing applications.

Full genome sequencing is already here. As the technology becomes more affordable and more accessible it's only a matter of time before we start to see the impact of full sequencing on the clinical validity of genetic tests.

For example, today, clinical validity for Mendelian disorders is fairly well established and result panels are typically based on a specific and known set of genetic mutations related to each disorder. However, full sequencing will impact results for these disorders dramatically as we are able to report on potentially thousands of mutations related to each condition and the specific mutations are likely to vary widely from person to person. Full sequencing is expected to have similar impacts to the clinical validity of pharmacogenetic and disease risk reports as well. As a result, we need to rethink how clinical validity is defined for all genetic testing.

23andMe would like to propose that a collaborative, cross-sector working group be convened to clearly define clinical validity specific to genetic testing. The final definition should reflect the consensus of all relevant government agencies, multiple professional healthcare associations (such as the American Medical Association, American Academy of Family Physicians, and National Association of Nurse Practitioners in Women's Health, among others), academic researchers and representatives from private industry, including pharmaceutical companies and genetic testing service providers.

The future of genetics is clear. The widespread adoption of full sequencing is not long off. 23andMe believes that consumers and healthcare professionals have a right to access the information the latest technology can provide – as long as they are clear about the limitations of that information. As we contemplate regulatory frameworks for genetic services it is important to put regulations in place based on the implications of evolving technologies, a constantly growing knowledge-base about human genetics and the functional realities of genetic testing.

Delivering Information: Transparency

The image displays four white paper covers from 23andMe, arranged in a 2x2 grid. Each cover features the 23andMe logo at the top. The top-left cover is titled 'White Paper 23-01: Estimating Genotype-Specific Incidence for One or Several Loci' and lists authors Mike McGeer, Brian Neigamon, and Andy Fox, with a creation date of November 1, 2007, and a last edit of November 18, 2007. The top-right cover is titled 'White Paper 23-03: Guidelines on Vetting Genetic Associations' and lists authors Andy Hsu, Brian Neigamon, and Shirley Wu, with a creation date of November 14, 2007, and a last edit of February 11, 2008. The bottom-left cover is titled 'White Paper 23-02: Estimating Genotype-Specific Incidence in the Context of Ethnic Variation' and lists authors Joanne Mountain, Andy Hsu, Mike McGeer, and Brian Neigamon, with a creation date of October 7, 2007, and a last edit of November 14, 2007. The bottom-right cover is titled 'White Paper 23-04: Global Similarity's Genetic Similarity Map' and lists authors Mike McGeer, Greg Warner, Josh Mera, Marcella Miyazawa, Chris Liguori, and James Vissarain, with a creation date of August 17, 2008, and a last edit of September 22, 2008.

White Paper 23-01
Estimating Genotype-Specific Incidence for One or Several Loci

White Paper 23-03
Guidelines on Vetting Genetic Associations

White Paper 23-02
Estimating Genotype-Specific Incidence in the Context of Ethnic Variation

White Paper 23-04
Global Similarity's Genetic Similarity Map

Transparency about the basis of the testing and reporting.

23andMe is currently an industry leader in some of today's best practices for transparency and clear communication. The following are a few examples from our service.

We provide direct access to our white papers that serve as the basis for the reports we provide to our customers. These include our criteria for including genetic associations in our health reports and our considerations and methodology for how disease risk is calculated, among others.

We are confident in the reports we provide, but it is important that customers can refer directly to source information. In this regard, we provide links to published research on genetic associations and we continually update this information as new research is published.

Delivering Information: Transparency

carrier status

Cystic Fibrosis ★★★★★

Established Research report on 31 reported markers.

Your Genetic Data

Who	What It Means
-----	---------------

Lilly Mendel (Mom)
Greg Mendel (Dad)
Patient2
Patient3
Patient4
Patient5
Patient16
Patient7
Patient8
Patient9
Patient10
Patient11
Patient12

Does not have any of 31 CFTR mutations reported by 23andMe. Most likely no disease and not a carrier. May still be a carrier due to other mutations in the CFTR gene (not reported here).



We are transparent about the limitations of our test.

Genes vs. Environment

Cystic fibrosis is inherited in a [recessive](#) manner, meaning that only a child who receives two mutated copies of the [CFTR gene](#) (one from each parent) will get the disease. More than 500 known mutations of the CFTR gene have been documented to cause CF, though most are extremely rare. In this report, 23andMe determines the presence or absence of 31 of the most common mutations. This means you may still have a CFTR mutation or be affected by cystic fibrosis even if your data indicates you are a non-carrier. If you are concerned about cystic fibrosis, consult a health professional.

A genetic counselor can help you understand more about your 23andMe reports and respond to your genetic health questions. 23andMe is collaborating with Informed Medical Decisions, Inc., to give you direct access to board-certified genetic counselors that have been specifically trained to guide you through your 23andMe results. [Click here](#) to learn more about their independent genetic counseling services.

We are clear about what we test for and what we don't test for... the use of definitions and disclaimers is particularly important.

Provide context and steps for what can be done with the information

What You Can Do

Assuming the ethnicity setting above is

Ask your doctor about screening tests

Ask your doctor about screening tests

The American Diabetes Association **recommends** diabetes screening for:

- everyone 45 years of age and older, particularly those with a BMI greater than 25
- people younger than 45 who are overweight and who also have other risk factors, such as a family history of blood pressure, or a history of gestational diabetes.

Testing can be a fasting blood glucose test, an oral glucose tolerance test or a hemoglobin A1C test.

Estimate your risk

Use the questionnaire available from [Your Disease Risk, Staman Cancer Center at Barnes-Jewish Hospital and Medicine](#) to get an estimate of your risk for type 2 diabetes.

Keep your weight in check

The [Diabetes Prevention Program](#), a federally-funded study published in 2002, found that people at high risk for minutes five days a week and lowered their intake of fat and calories were able to reduce their weight by 5-7% a diabetes by 58%.

Learn your family medical history

Learn your family medical history

According to the [American Diabetes Association](#), a family history of type 2 diabetes is one of the strongest risk factors for people living a Western lifestyle. In these societies, the risk of developing type 2 diabetes is about one in seven was diagnosed before age 50, and about one in 13 if the parent was diagnosed at a later age. The risk is even higher if you have a family history of diabetes. The U.S. Surgeon General's [My Family Health Portrait](#) tool can help you assemble your family medical history.

Connect with relevant groups

- American Diabetes Association
- 800-DIABETES

Talk with a genetic counselor

Talk with a genetic counselor

A [genetic counselor can help you understand](#) more about your 23andMe reports and respond to your genetic health questions. 23andMe is collaborating with Informed Medical Decisions, Inc., to give you direct access to board-certified genetic counselors that have been specifically trained to guide you through your 23andMe results. [Click here](#) to learn more about their independent genetic counseling services.

disease risk

Age-related Macular Degeneration ★★★★

Established Research report on 3 reported markers, updated May 21st, 2018



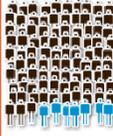
Jane Doe

11.3 out of 100

people of European ethnicity who share Ashley Gould's genotype will develop Age-related Macular Degeneration between the ages of 43 and 79.

What does the C

Use the ethnicity incidence of Age with **Jane Doe** a person is free the name select Macular Degene



Average

7.0 out of 100

people of European ethnicity will develop Age-related Macular Degeneration between the ages of 43 and 79.

The 23andMe O known associati aside from gene chances of deve

The use of graphics and charts in our various reports to visually represent data is an important part of our efforts to ensure information is communicated clearly. We believe these tools can also be equally useful in a clinical setting.

Repetition is also an important element of effective communication, which is why we explicitly remind our customers, in multiple locations across our website, that they should discuss their results with their doctor or other healthcare professional if they have questions about how their results may impact their healthcare.

Delivering Information: Transparency
Clearly state medical decisions require physician interaction

drug response

Warfarin (Coumadin®) Sensitivity ★★★★★ ⓘ [share this](#)

Established Research report on 3 reported markers.

[Your Data](#) [How It Works](#) [Resources](#) [Technical Report](#) [Next ▶](#)
Adjponectin Levels

Only a medical professional can determine whether warfarin is the right medication for a particular patient. The information contained in this report should not be used to independently establish a warfarin regimen, or abolish or adjust an existing course of treatment.

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23andMe believes physicians and other healthcare professionals have an important role to play in Direct Access Genetic Testing and we are committed to working with healthcare organizations to maximize the provider-patient relationship related to genetic testing.

In this regard, we think that the practical implementation of personalized medicine requires an evaluation of the current payor systems and business models for improvements to ensure that access to and use of genetic information is not burdensome on healthcare professionals, our larger healthcare system or consumers.

23andMe is also interested in the collaborative development of CME or other professional education programs for genetic testing together with medical schools and organizations such as the American Medical Association, American Academy of Family Physicians, and the National Society of Genetic Counselors, so that healthcare professionals are prepared to incorporate genetics into their practice.

Finally, we consider ourselves industry leaders with regard to transparency and believe that our experience can help inform the development of regulation. That said, there is always room for improvement. There is an opportunity to better educate people about genetics generally and our customers specifically. In this regard, we would like to work with organizations to maximize comprehension through accessible language. As the industry continues to grow, we may also need to consider providing information in multiple languages.



Rights of the Public, Patients and Physicians

- Policy and Regulation is ultimately about protecting all people – physicians, patients and consumers
- Fundamental Right for Individuals to Access Their own DNA
- Access to Accurate & Reliable Genetic Data

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Ultimately, policy and regulation is meant to protect people -- whether you call them patients or consumers.

We firmly believe that individuals have a fundamental right to directly access information about their own DNA. Empowering people to become informed healthcare consumers is critically important to making the widespread practice of personalized medicine a reality.

We also believe that whenever anyone – a physician or an individual person – accesses genetic information they have a right to genetic data that is accurate and reliable.

Addressing Fear

We must build dikes of courage to hold back the flood of fear.

Martin Luther King, Jr.

Concerns:

- What if someone were traumatized by learning they were at high risk for a certain disease?
- What if the risk assessments were inaccurate/inconsistent?
- What if people misinterpreted the results?

Experience:

- 23andMe has more than 75,000 customers
- 3+ years of customer insight and feedback
- Independent studies indicate there is no basis for these concerns



Protecting the fundamental right of an individual to access his or her genetic information requires addressing some of the more common concerns about Direct-Access Genetic Testing.

23andMe has more than 3 years of customer insight and anecdotal evidence to draw upon. In fact, we now have more than 75,000 genotyped customers and to date, we have no anecdotal evidence to suggest that any of the voiced concerns pose real, demonstrable risk to individuals.

In addition, independent studies conducted by the Genetics and Public Policy Center and Scripps Institutes indicate there is no basis for these concerns. We partnered with the GPPC in their study and are currently teaming up with Robert Green and Scott Roberts on a new study of reactions to personal genomic information.

It is imperative that policy and regulation be based on facts and evidence about how consumers respond to learning directly about their genetic information rather than assumptions about *possible* irrational consumer behavior and fears that have not been substantiated.

Benefits

Individuals:

- Increased awareness of carrier status
- Increased awareness of drug sensitivities
- Shifts mindset to awareness and prevention rather than responding only to symptoms
- Increases likelihood of early detection & possible prevention for some health conditions.
- Enables individuals to actively participate in their health management
- Enables individuals who do not have access to family history to fill in some of the gaps about their health and ancestry
- Objective source of information that disregards perceived ancestry or “known” family history
- Broader use of genetic information beyond medical context
- Direct Access can be cost efficient for consumers – One 23andMe test gives consumers approximately 185 health and trait reports as well as genetic ancestry information

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Based on 23andMe’s experience, so much of the conversation about Genetic Testing has been focused on perceived risks and concerns of Direct-Access, so we feel it is important to take a moment to recognize all the various ways Direct-Access Genetic Testing benefits both individuals and the broader field of healthcare.

The benefits of Direct-Access Genetic Testing serve as a foundation to preventive care, which can increase early detection rates, which can be key to effective treatment.

It is also important to recognize that people interact with their genetic information in a variety of ways, and many of these are unrelated to medical decision-making.

Benefits

Advancing Medical Genetic Research:

- Makes Researching the Human Genome Faster and More Efficient
 - ✓ Enables increased consumer participation
 - ✓ Ability to conduct multiple research studies in parallel
 - ✓ Reduces research timeframes and costs
- Facilitates translation of research results into potential cures and practical therapies.
- Research Communities connect individuals with similar conditions and symptoms
 - ✓ Parkinson's Disease Research Community
 - ✓ Sarcoma Research Community
 - ✓ More 23andMe Research Communities to Come

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It is only with Direct-Access Genetic Testing that individuals have greater access to participate in medical research as barriers such as time and geography can be removed. Surveys can be completed at the participant's convenience and the need for physical visits to a research clinic can be eliminated or reduced. Large numbers of participants are critical to advancing our understanding of human genetics.

Our experience shows that when individuals learn about their own genetic data, participating in research becomes more personal and more interesting to them. 23andMe has rates of research participation which far exceed industry standards.

- Of our more than 75,000 genotyped customers 78% have consented to participate in our IRB approved research; and more than 83% of those have answered at least one survey.
- Our Research communities also connect individuals to others with similar conditions and symptoms, providing a sense of community and support.

Benefits: Genetics Education

23andMe provides a collection of educational materials to guide you on your personal journey of genetic discovery. Explore our learning resources and discover the world of genetics!
New: [Human Prehistory 101](#)

Genetics 101

Watch an animated guide to your genes, SNPs, phenotype, and more.

Part 1: What Are Genes?



Find out about the basics of cells, chromosomes, and the genes contained in your DNA.

Part 2: What are SNPs?



Learn about the variations in human DNA called SNPs, and how they can be used to understand relationships between people.

Part 3: Where do your genes come from?



Find out how chromosomes and genes are passed down from parent to child.

Part 4: What is phenotype?



Discover how your observable traits, or phenotypes, are the result of interactions between your genes and environment.

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Direct-Access Genetic Testing itself enables individuals to learn about the basics of genetics through the lens of their own data.

23andMe also provides an engaging and widely available platform for education about genetics.

We started our efforts by focusing on consumers. We have a series of educational videos on our website that are easy to understand and openly accessible. In fact, we've posted these videos to YouTube and to-date we've had nearly half a million (480,307) views— this does not include viewers who have watched the videos directly on our website.

The next step is to develop CME or other professional education programs, as mentioned earlier, by partnering with various medical associations, professional healthcare organizations and medical schools.

Policy & Regulation

With Thoughtful Policy...

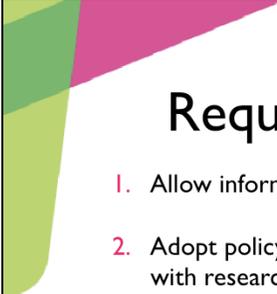
- Continuation of Direct-Access
- Evidence-based
- Keep pace with innovation
- More flexible than traditional policy paradigms

23andMe Supports Regulation:

- Clearly defined, high-quality standards for all genetic testing services:
 - ✓ Analytical & Clinical Validity
 - ✓ Analytical Standards
 - ✓ Transparency

The policy that guides regulation of Genetic Testing services must be flexible enough to keep pace with innovation and rapid technology advancement. It must also accommodate the practical realities of genetic testing and the evolving understanding of the human genome.

On that basis, 23andMe supports regulation that clearly defines high-quality standards of Analytical & Clinical Validity, Analytical Standards, and Transparency.



Requests for Consideration

1. Allow informed consumers to learn about their own DNA
2. Adopt policy that promotes innovation and is flexible enough to evolve with research & technology
3. Define clinical validity specific to genetic testing
4. Establish clear requirements for analytical & clinical validity, analytical standards and transparency that apply to all genetic testing service providers

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In conclusion, I leave you with 23andMe's requests for your consideration:

First, continue to allow informed consumers to freely learn about their own DNA.

Adopt thoughtful **policy** that promotes innovation and is flexible enough to evolve with new technologies and research developments.

Through a cross-sector working group, effectively **define clinical validity** specific to genetic testing.

Finally, focus on **establishing requirements** for analytical and clinical validity, analytical standards and transparency that apply to all genetic testing services. Genetic information provided directly to consumers should be held to the same standards as genetic information provided in a clinical setting.

Thank you all for your time and consideration today.