

# **Session Gene Patents and Licensing Practices**

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Gene Patents and Licensing Practices**

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# SACGHS Task Force on Gene Patents and Licensing Practices

## SACGHS Members

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- Sylvia Au
- Mara Aspinall
- Rochelle Dreyfuss
- Joseph Telfair

## Ad Hoc Members

- Chira Chen
- Debra Leonard, Cornell Medical School
- Brian Stanton, REDANDA Group
- Emily Winn-Deen, Cepheid

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- Scott Bowen, CDC
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- Charles Keckler, ACF
- John LeGuyader, PTO
- Mark Rohrbaugh, NIH OTT

## Consultants

- Robert Cook-Deegan
- Lori Pressman

## Science Writer

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## SACGHS Activities to Date

- **March 2004** – Identified gene patents and licensing as a SACGHS priority issue; deferred further effort given NRC activity
- **October 2005** – Formed a small group to review the NRC report
- **March 2006** – Endorsed NRC report's general thrust but saw limitations in terms of its relevance to patient access questions; agreed that more information regarding patient access was needed

# SACGHS Activities to Date

- **June 2006** – Informational session for SACGHS
  - Decided to move forward with an in-depth study, focused on how gene patents and licensing practices affect patient access to genetic tests
  - Discussed study scope and work plan
  - Established SACGHS Task Force on Gene Patents and Licensing Practices to guide study
- **October 2006** – First Task Force meeting
  - Refined proposed scope for study
  - Outlined potential approaches for study

# SACGHS Activities to Date

- **November 2006** – SACGHS Meeting
  - Presented study scope and work plan to full Committee
  - Scope and work plan approved

# SACGHS Activities to Date

- **February 2007** – Task Force Meeting
  - Discussion of study scope and work plan
  - Meeting with Robert Cook-Deegan and other members of Duke University Center for Genome Ethics, Law, and Policy (CGE) to develop literature review and relevant case studies

# SACGHS Activities to Date

- **March 26, 2007** – Special Task Force Meeting
  - Presentations by Duke CGE
  - Discussion of next steps
- **March 27, 2007** – SACGHS Meeting
  - Primer session on gene patents and licensing practices in the U.S.
  - Update from Duke University collaborators on status of literature review and case study analysis

# SACGHS Activities to Date

- **July 10, 2007** – SACGHS Meeting
  - Briefing on Patent Reform initiatives in the 110<sup>th</sup> Congress
  - International roundtable on gene patents and licensing practices
    - Overview of international gene patent and licensing landscape
    - Review of BRCA testing in Canada and the U.K.
    - Comparison of the patent system of the U.S. and select countries
    - Review of international reports and recommendations regarding gene patents, licensing strategies, and genetic tests

# Purpose of Today's Session

- 1) To review and discuss the *Public Consultation Draft Report on Gene Patents and Licensing Practices and Their Impact on Patient Access to Genetic Tests*
- 2) To review and discuss the range of policy options for public consideration
- 3) To seek Committee's approval of draft report and decide on the range of policy options for public consideration for release for a 60-day public comment period in early 2009

# Gene Patents and Licensing

Background Material

# Why Define and Protect Intellectual Property?

- Promote development of ideas
- Promote investment in ideas
- Allow and encourage “openness” and discourage secrecy as stimulus to further development
- Reward innovators (“Natural Rights”)
- The law recognizes several distinct types of IP
  - Trademark
  - Copyright
  - Trade Secret
  - Patent

# Patents

- US Constitution, Article I, Section 8:
  - “To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries”

# Patents as Tradeoffs

- Government grants a right of limited duration (typically 20 years from filing) to prevent others from making, using, selling or importing the claimed entity.
- In return for this right, the patentee discloses the invention to the public
  - Thus presumably fostering further research and development

# Patent Requirements

- To be granted a patent, one must demonstrate that the patented invention is:
  - Useful
  - Novel
  - Non-obvious

# Patents on Genes & Life Forms

- Patenting of chemicals isolated from nature through human innovation
  - 1911: Adrenaline (Parke-Davis v HK Mulford)
  - 1923: Insulin
  - 1958: Prostaglandins
  - 1980: Genetically engineered microorganism (Diamond v. Chakrabarty)
- *Isolated* genes (and life forms) are thus considered “compositions of matter” and are eligible for patenting by the USPTO
- Most of the world, including Europe, China, Japan, Australia and the US, allow patenting of genes
  - Though the US has more liberal criteria for awarding genetic patents

# What's The Problem?

## *Controversies in Gene Patenting and Licensing Practices (GPLP)*

- Seen as both a moral and a practical problem
- Many stake-holders with differing opinions and incentives
  - The public
  - Patients
  - Clinicians
  - Industry
  - Academic researchers
  - Academic laboratories
  - Small innovators
  - Ethics-based groups

# Overlapping Interests

- The stakeholders have distinct interests
  - Their interests overlap and are sometimes, but not always, mutually exclusive
- We, as individuals, comprise the public
- We are all potentially patients
- Even those with no direct financial stake have interest in commercialization if such commercialization enhances availability

# Breaking Down the Controversy Over Gene Patents

*How is the current system working  
in the realm of diagnostics?*

- **Perceived problems:**

- Moral arguments
- Inhibition of research
- Inhibition of patient access
  - Through effects on pricing
  - Limitations on volume due to sole provider
- Inhibition of product / test improvement due to sole provider/lack of competition
- Inhibition of test verification
- Detriment to quality (no incentive for QC)
- Creation of patent thickets

- **Perceived benefits:**

- Moral arguments
- Induced investment
  - Prevents the “free rider”
  - Compensates for need for post-invention investment
    - Especially important in realm of greater regulatory burden
- Stimulates commercialization
- Test aggregation benefits
- Empowers the “little guy” to enhance innovation
- Gene patents are only one small part of a complex system that has generally worked well (baby & bath argument)

# Moral and Ethical Arguments

- Moral objections to patenting of genes are often deontological (inherent value driven)
  - There is something inherently special about our genes
    - They define us in a special way that epinephrine and insulin do not
  - Often phrased in terms of ownership
    - “No one should own your genes”
- Such arguments rely largely on the concept of genetic exceptionalism
- Also utilitarian arguments
  - Patenting inhibits research, development and access

# Moral and Ethical Arguments

- Moral arguments for patenting genes are often utilitarian
  - Benefits accrue to society by harnessing self-interest via the granting of patents, thereby encouraging innovation
- Value-driven arguments exist
  - Reward should accrue to the inventor (the Natural Rights argument for patenting)

# Does Patenting = Ownership?

- Q: Who “owns” your genes?
- A: It depends if they are:
  - In your body
    - You do
  - Have been extracted and are now in a test tube
    - The hospital/company/lab

***You own the tangible personal property, but someone else owns the intangible intellectual property***

# Effects of Current System on Research

- Focus of an NIH commissioned NRC report\* that addressed patents and licensing practices and their effects on research and innovation
  - Concluded that “For the time being, it appears that access to patented inventions or information inputs into biomedical research rarely imposes a significant burden for biomedical researchers”
  - It was felt that there were, however, several reasons to be “cautious about the future”
    - Increasing complexity of GPLP landscape
    - Potential for patent thickets due to multiplex technologies
    - Impact on patients and access to genetic technologies/testing
      - Concerns over independent verification of sole provider offered tests who limit such verification

# The Role / Need of Patents to Induce Investment

- A major function of the patent system is to induce investment
  - Especially vital when development costs are high and copying costs are low
- The specific use to which genetic knowledge is applied affects the need for patent protection
- All gene applications are not created equal

# Scope of SACGHS Study

- Positive and negative effects of current gene patenting and licensing practices on patient access to genetic technologies
  - focusing on gene patents for health-related tests (diagnostic, predictive, or other clinical purposes)
  - encompassing both “clinical access” and “patient access”
  - considering the effects on translational research
  - Excluding drug or other therapeutic product development

# STUDY PLAN

## Part 1: Data Gathering & Analysis

- Literature Review
- Expert Consultations
- Case Studies
- Additional Research?

## Part 2: Gathering Public Perspectives

- Solicitation
- Compilation and Summary of Comments
- Analysis of Public Perspectives

## Part 3: Gathering International Perspectives

- Data Gathering
- Identification of Experts
- Roundtable
- Analysis of International Perspectives

Analysis and synthesis of literature review, data collected, input from Roundtable experts and international approaches, and development of recommendations

Draft Report Released for Public Comment

Analysis of Public Comments and Revision of Report and Recommendations

Final Report to Secretary of Health and Human Services

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# Terminology

- **Genetic Tests** are, for purposes of this study, any test performed using molecular biology methods to test DNA or RNA, including germline, heritable, and acquired somatic variations.
- **Clinical Access** means a health care professional's ability to obtain or provide genetic tests for patients, which involves reimbursement and cost issues in addition to medical use of genetic information.
- **Patient Access** is the ability of a patient to obtain needed genetic testing.

# Study Questions

- **Patent Policy and Practice**
  - What is the role of U.S. patent policy in patient/clinical access to existing and developing genetic tests?
  - How does patent owner's use, enforcement, and licensing of patented genetic information affect patient/clinical access?
  - How does legal interpretation of the patentability and patent boundaries affect patient/clinical access to such technologies?

# Study Questions

- **Licensing Policies and Practices**
  - How are licensing practices affecting patient/clinical access to genetic information and tests?
  - How are licensing practices affecting the ability of industry and academia to develop genetic tests?
  - What role do technology transfer programs play in influencing clinical access to genetic tests?

# Study Questions

- **Evidence**

- If there are barriers to patient/clinical access to genetic tests, where within the health care system do such barriers exist?
- What elements of the patent system relate to these aspects of the healthcare system?

# Study Questions

- **Evidence** (continued)

## *Development and Translation Effects*

- In what ways do gene patents and/or licensing and enforcement practices enhance or create incentives or barriers to the development, implementation, and continued performance of clinical genetic tests?

# Study Questions

- **Evidence** (continued)

## ***Cost of Tests***

- What are the economic data or studies that analyze the contribution of gene patents to the cost of genetic tests and ultimately to patient access and treatment outcomes?
- What is the evidence of positive and negative effects of gene patents and licensing/enforcement practices on the cost and pricing of genetic tests?

# Study Questions

- **Evidence** (continued)

## *Quality of Tests*

- How is the quality of genetic testing affected by gene patents and licensing practices?
- How are gene patents and licensing practices impacting (and how might they impact) the ability to perform multiple gene tests, panels, and arrays?

# Study Questions

- **Evidence** (continued)

## *Other Measures / Approaches*

- What other measures and approaches can be employed to assess the direct effect of gene patents and licensing practices on patient access and treatment outcomes to genetic tests?

# Study Questions

- **Alternative Models**
  - Are there feasible alternative models, perhaps from other countries, and innovations that could be applied to the patent and licensing system to enhance the benefits of the system?
  - What are the lessons from parallel situations, in healthcare and other areas, where patents have enhanced or restricted access to a technology?

# STUDY PLAN

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# Previous Policy Studies

- Nuffield Council, 2002  
*The Ethics of DNA Patenting*
- Federal Trade Commission, 2003  
*To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*
- Australian Law Reform Commission, 2004  
*Genes and Ingenuity: Gene Patenting and Human Health*
- Organisation for Economic Co-operation and Development, 2006  
*Guidelines for the Licensing of Genetic Inventions*
- National Research Council, 2006  
*Reaping the Benefits of Genomic and Proteomic Research: Intellectual Property Rights, Innovation, and Public Health*

# Case Studies

Case studies were commissioned by SACGHS and conducted by Dr. Robert Cook-Deegan and colleagues at the Center for Genome Ethics, Law & Policy at Duke University

- Subhashini Chandrasekharan, PhD
- Christopher Heaney
- Christopher DeRienzo, MD, MPP
- Julia Carbone, JD, LL.M
- Tamara James
- Melissa Fiffer, MEM
- Emily Pitlick, JD
- Ashton Powell, PhD
- Alessandra Colaianni
- Misha Angrist, PhD
- Christopher Conover, PhD

# Case Studies

- Breast and Colon Cancer
- Alzheimer's Disease
- Spinocerebellar Ataxia
- Hearing Loss
- Hemochromatosis
- Tay Sachs and Canavan Disease
- Cystic Fibrosis
- Long QT Syndrome

# Case Studies

- **The case studies provide a broad analysis of the patenting and licensing formats for disease genes and diagnostic tests, including:**
  - Context of “natural experiments”
  - General lessons learned
  - Diagnostic development
  - Commercialization (approximation of patent premiums)
  - Communication and marketing
  - Adoption by clinical providers and testing labs
  - Adoption by third party payers
  - Consumer utilization

# Case Studies

- **Parameters of “access” include:**
  - Whether a diagnostic test is available, and whether improvements are also available
  - Cost of the test is reasonable to both the provider and patient
  - How quickly the test is available following the discovery of the connection between a particular genotype and phenotype, and how rapidly the test evolves and improves with use and future discoveries
  - The number of distinct test providers

# Case Studies

- **Factors that affect “access”:**

- Directly Influenced by Intellectual Property Rights***

- Availability of a test following discovery of a particular gene or mutation associated with a disease
    - Number of providers offering a test
    - Test price

- Indirect Factors***

- Coverage and reimbursement of a test by private insurers and other third-party payers
    - Utility of a test for clinical decision making
    - Quality of testing services
    - Logistical issues (“hassle factors”)
    - Fear of genetic discrimination

# Case Study #1:

## Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **BRCA1 and BRCA2 genes**
  - Increase individual's risk for breast and ovarian cancers
  - Broad patent rights to both genes held by Myriad Genetics, Inc.
  - Myriad Genetics, Inc. is the sole provider of full-sequence BRCA testing in the U.S.
- **Hereditary Non-Polyposis Colorectal Cancer (HNPCC) and Familial Adenomatous Polyposis (FAP)**
  - Mutations in HNPCC-associated genes (MLH1, MSH2, MSH6) and FAP-associated gene (APC) are strongly associated with development of colon cancer
  - Patent rights for these genes are predominantly held by nonprofit entities and licensed nonexclusively
  - Multiple test providers for full-sequence analysis of genes associated with HNPCC and FAP (including Myriad Genetics, Inc.)

# Case Study #1:

## Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **Test Price**

- **BRCA1/2 Full Sequence Analysis: \$3,120**
  - Myriad Genetics, Inc. is sole provider of this test
- **HNPCC testing ranges from \$1,150 per gene to \$4,760 for sequence analysis of all three genes (refer to case study for detailed range)**
- **HNPCC rearrangement testing services vary in availability and cost**
  - Myriad Genetics, Inc. charges \$2,950 for its COLARIS® test, which includes full sequence analysis and testing for major rearrangements
- **FAP testing ranges from \$1,200 to \$1,795 for sequence analysis of the APC gene**
- **FAP rearrangement or dosage testing services vary in availability and cost**
  - Myriad Genetics, Inc. charges \$1,795 for its COLARIS AP® test, which includes full-sequence analysis for the APC gene and major rearrangements as well as two mutations of the MYH gene, also associated with FAP.

## Estimating “Patent Premiums”

- BRCA1/2 testing (Hereditary breast/ovarian cancer)
  - Myriad Genetics is the sole provider (exclusive rights)
  - Test cost: \$3,120
    - \$38.05 / amplicon
- APC for Familial Adenomatous Polyposis (GI Cancer Predisposition with polyps)
  - Offered by multiple providers, including Myriad Genetics
    - Cost of testing through Myriad: \$1,795
      - \$40.80 / amplicon
        - » Includes southern blot rearrangement and insertion-deletion testing plus two common mutations of the MYH gene
    - Cost of testing through non-profit competitor laboratories ranges from \$1,200 to \$1,675
      - \$28.57 - \$39.88 / amplicon
        - » Rearrangement testing is generally not included in this price.

## Estimating “Patent Premiums”

- HNPPC testing for hereditary predisposition to colorectal (Lynch Syndrome), uterine, and ovarian cancers
  - Offered by multiple providers, including Myriad Genetics (nonexclusively licensed)
    - **Cost of testing through Myriad: \$2,950**
      - \$49.17 / amplicon
        - » Includes Southern Blot analysis
        - » Compare with \$38.05 / amplicon for the BRCA test, which is exclusively licensed
    - **Cost of testing through non-profit competitor laboratories ranges from \$1,800 - \$4,464**
      - \$30.00 - \$77.44 / amplicon
        - » Generally does not include rearrangement testing

# Case Study #1:

## Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **Concerns Regarding Myriad's Sole Provider Status**
  - Definition of what constitutes "infringement" is too broad
  - Limits strategies for testing
  - Incomplete testing
- **Concerns Regarding Myriad's Patent Enforcement**
  - 2003 survey found 9 instances of enforcement of the BRCA patents by Myriad
    - Same survey found 2 instances of FAP patent enforcement and 0 instances of HNPCC patent enforcement
  - Enforcement actions serve to clear the market and drive users (clinicians, patients) to Myriad's testing services

# Case Study #1:

## Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **Did prospect of patents encourage search for gene-disease association?**
  - Precise stimulus for breast/ovarian cancer gene search is unclear, although access to data and exclusive rights to therapeutics involving genes attracted industry funding for the search
  - Development and commercialization of a test for the HNPCC gene MLH1 did play a role in stimulating research in this area
    - HNPCC patents have been nonexclusively licensed
- **Role of patents in test commercialization**
  - Myriad enforces its BRCA1/2 patents and serves as the sole provider of this testing service
  - Patents for HNPCC and FAP associated genes have been licensed nonexclusively, and there is a range of providers and services

# Case Study #1: Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **How did patent(s) and licensing practices affect price?**
  - As the sole provider of the BRCA1/2 test, the main effect of the patent is on testing volume rather than price
  - Patent premium depends on price-elasticity and anticipated volume (lower price = more users versus higher price = fewer users)

# Case Study #1: Comparison of Testing for Heritable Breast and Ovarian Cancers and Colon Cancer

- **What is the potential that the patent may cause some future harm?**
  - Myriad could file patent applications for new mutations identified in the BRCA1 and BRCA2 genes
  - How will companies offering whole-genome sequencing address issues related to sequencing parts of the genome are under patent protection?

# Case Study #2: Alzheimer's Disease

- **Associated Genes:**
  - Early-onset: Presenilin-1 (PSEN1), Presenilin-2 (PSEN2), and Amyloid Precursor Protein (APP)
  - Late-onset: Apolipoprotein E,  $\epsilon$ 4 allele (ApoE  $\epsilon$ 4)
  - Protective: Apolipoprotein E,  $\epsilon$ 2 allele (ApoE  $\epsilon$ 2)
- **Genetic Testing:**
  - Broad screening is not recommended for any of these genes
  - Screening only considered appropriate for blood relatives of individuals who had AD as a result of mutations in PSEN1/2 and APP
  - Testing for ApoE is only recommended to confirm diagnosis of individuals who already have developed dementia
  - ApoE testing is also offered for cardiovascular purposes

## Case Study #2: Alzheimer's Disease

- **Patents and Licenses:**
  - Patents have been issued in the U.S. relative to testing for the four genes involved in early- and late-onset AD
  - Duke University holds three “methods” patents on ApoE testing which are licensed exclusively to Athena Diagnostics

# Case Study #2: Alzheimer's Disease

- **Test Price**

- ApoE Testing

- Athena Diagnostics \$475
    - Canadian Laboratories \$100 / \$120
    - Smart Genetics (DTC Kit) \$399
    - Saint Louis University Health Science Center \$365  
(Cardiovascular purposes only)

- Health insurance companies differ over whether to cover AD testing or deny claims on the ground that the tests are still experimental

## Case Study #2: Alzheimer's Disease

- **Did prospect of patents encourage search for gene-disease association?**
  - Case study indicates that the prospect of a patent was not needed to stimulate research in the area of Alzheimer's disease
- **Role of patents in test commercialization**
  - Patents provided a mechanism for aggregating patent rights from disparate academic groups and consolidating testing service for AD to Athena Diagnostics
  - Consolidating testing services to Athena Diagnostics was intended to limit testing to those individuals already diagnosed with dementia or to family members of those diagnosed with AD

## Case Study #2: Alzheimer's Disease

- **How did patent(s) and licensing practices affect price?**
  - It is unclear how Athena's enforcement of exclusively licensed ApoE patents affected price, although the two Canadian providers offer testing at a significantly lower price
  - Price information not available for PSEN2 and APP testing
- **Role of patents and licensing practices in test availability**
  - It is unclear whether Athena's monopolies will benefit or harm availability
  - Athena offers two programs to reduce out-of-pocket costs of testing:
    - Patient Protection Program: limits to 20% out-of-pocket expenses for patients whose insurance does not cover the test
    - Athena Access: offers free or low-cost testing to some patients

## Case Study #2: Alzheimer's Disease

- **What is the potential that the patent may cause some future harm?**
  - It is not clear whether multiplex tests would infringe the patents in this case study
  - It is not clear whether DTC tests, such as Navigenics' personal genomics test, would infringe the patents by indirectly assessing AD risk associated with ApoE
  - Similar uncertainty with complete genome sequence analysis

# Case Study #3: Spinocerebellar Ataxia

- **Background:**

- SCA is a rare subset of neurological diseases, characterized by loss of cells in cerebellar portion of the brain and inherited in a variety of Mendelian patterns dependent upon the gene involved
- SCA is highly genetically heterogeneous with dozens of genes responsible for clinically similar conditions
- There are population differences in prevalence of various mutations (e.g. Mexican population and SCA10)
- SCA accounts for <5% of the ataxic population

- **Genetic Testing:**

- Available for 15 variants of SCA

## Case Study #3: Spinocerebellar Ataxia

- **Patents and Licenses:**
  - Athena Diagnostics holds the patent or exclusive license to 12 patents that identify the most commonly occurring variants (~60-80% of known SCA cases)
  - Athena Diagnostics was granted a nonexclusive license by Baylor Medical College for a patent that covers methods for detecting SCA-10
  - Athena Diagnostics has enforced its exclusive licenses and is widely assumed to be the sole distributor of these tests

# Case Study #3: Spinocerebellar Ataxia

- **Test Price**

- Testing for individual genes can range from \$400 to \$2,335, depending on the laboratory techniques employed
- Athena Diagnostics also offers the Complete Ataxia Panel, a compilation of 13 tests that cover the most commonly identified SCA mutations, for \$7,300
- Athena offers two programs to reduce out-of-pocket costs of testing:
  - Patient Protection Program: limits to 20% out-of-pocket expenses for patients whose insurance does not cover the test
  - Athena Access: offers free or low-cost testing to some patients if provided with extensive documentation by patient

## **Case Study #3: Spinocerebellar Ataxia**

- **Did prospect of patents encourage search for gene-disease association?**
  - Was not addressed in the case study
- **Role of patents in test commercialization**
  - Various patent holders exclusively licensed their patents for different SCA gene variants to Athena Diagnostics, which then developed various genetic tests for SCA, including a testing panel
  - Athena Diagnostics has a nonexclusive license from Baylor Medical College for methods for detecting SCA-10

## Case Study #3: Spinocerebellar Ataxia

- **How did patent(s) and licensing practices affect price?**
  - Athena Diagnostics is the sole provider of genetic tests for SCAs
  - Study authors could not determine what fraction of the tests' costs are attributable to Athena's exclusive in-licensing of relevant patents
- **Role of patents and licensing practices in test availability**
  - Athena's aggregation of SCA patents enables a single laboratory to test for many variants of a relatively rare syndrome
    - Remains an open question as to whether such licensing is necessary for aggregation of testing (counter examples include HNPCC)

## Case Study #3: Spinocerebellar Ataxia

- **What is the potential that the patent may cause some future harm?**
  - Athena's consolidation of intellectual property related to SCA results in an effective monopoly for genetic testing for these syndromes
  - Enforcement of patent rights has been aggressive, leading several labs that might have offered SCA testing to avoid offering these services
  - Lack of competition raises concerns of reduced incentive to improve testing services
  - One clear example of hindrance to access that stems from sole-provider status by Athena Diagnostics:
    - Athena does not have a contract with MediCal (California Medicaid Program)
    - MediCal patients can thus not be tested due to exclusive status of licenses
    - No alternative test available
      - » Other labs which do have contracts with California would likely offer testing if licensing was not an obstacle

# Case Study #4: Hearing Loss

- **Background:**

- At least 65 genes have been implicated in hearing loss
- Mutations in five genes are associated in the most common forms of hearing loss:
  - GJB2/Connexin 26
  - GJB6/Connexin 30
  - SLC26A4/PDS
  - MTRNR1
  - MTTS1

- **Genetic Testing:**

- Available through multiple providers for the five genes listed above (focus of the case study)

## Case Study #4: Hearing Loss

- **Patents and Licenses:**

- Three of the five genes discussed in this case study are not patented (GJB6, SLC26A4, and MTTTS1)
- Test prices do not appear to correlate with patent status
- GJB2 testing is licensed exclusively to Athena Diagnostics, but is offered by at least 10 other providers
- MTRNR1 testing is licensed exclusively to Athena Diagnostics, but is offered by 6 nonprofit providers
- Lack of enforcement at present
  - Potential for patent thickets if enforced

# Case Study #4: Hearing Loss

- **Test Price**

- Prices for individual tests vary, but do not appear to correlate to patent status:
  - GJB2/Connexin 26      range: \$290 - \$818
  - GJB6/Connexin 30      range: \$161 - \$534
  - SLC26A4/PDS          range: \$1,100 - \$2,507
  - MTRNR1                range: \$150 - \$365
  - MTT51                  range: \$150 - \$285
- The clinical presentation offers little clue to which gene might be mutated

(Yellow = not patented)

# Case Study #4: Hearing Loss

- **Did prospect of patents encourage search for gene-disease association?**
  - Patents did not appear to hinder research efforts in this area, nor was the prospect of patents a primary driver of the research
  - Some genes and methods were patented to preserve potential commercial interest in any tests that could be developed
- **Role of patents in test commercialization**
  - Diagnostic tests for both patented and unpatented genes have been developed and are offered as a clinical service by multiple providers
  - Demand for testing or institutional interest in hearing loss research serve as primary factors in determining whether diagnostic testing for a particular gene is offered as a clinical service

## Case Study #4: Hearing Loss

- **How did patent(s) and licensing practices affect price?**
  - Costs of hearing loss tests do not appear to correlate strongly with patent status
- **Role of patents and licensing practices in test availability**
  - Lack of correlation between patent status and test cost
  - Lack of utilization data

## Case Study #4: Hearing Loss

- **What is the potential that the patent may cause some future harm?**
  - Enforcement of exclusive licenses may result in reduced access to tests
  - It is unclear how patents will affect access to gene chip or microarray based diagnostics
    - Depends on how aggressively exclusive licensees choose to enforce their patent rights

# Case Study #5: Hereditary Hemochromatosis

- **Background:**
  - Common autosomal recessive disorder with low penetrance
  - Results most often from mutations in the HFE gene
  - HFE gene was discovered and patented by a start-up company in the mid-1990s
  - Complex business transactions added uncertainty to whether and to what extent patent rights would be enforced
- **Genetic Testing:**
  - Testing currently available through multiple providers
  - Broad availability not always the case:
    - Exclusive licensing and single-provider model
    - 2002 *Nature* article concluded that hemochromatosis testing had “failed the test” of socially optimal access

# Case Study #5: Hereditary Hemochromatosis

- **Patents and Licenses:**
  - HFE gene, two mutations, C282Y and H63D, methods for detecting mutations, and methods for analyzing mutations using a kit were patented by Mercator Genetics (acquired by Progenitor)
  - Other patents in the same patent family were issued between 2000 and 2006 and were assigned to Bio-Rad
    - Patents include diagnostic methods for a panel of less prevalent mutations, polypeptides related to the HFE gene, and the associated proteins.

# Case Study #5: Hereditary Hemochromatosis

- **Test Price**

- Prices for targeted testing of the two major disease-associated alleles varies based on the platform technology utilized (targeted mutation analysis, allele-specific mutation analysis, RFLP/electrophoresis analysis)
- From a subset of providers, costs can range from \$158 to \$467.25

## Case Study #5: Hereditary Hemochromatosis

- **Did prospect of patents encourage search for gene-disease association?**
  - Prospects of patents and revenue from diagnostic testing probably stimulated research, and induced investment for the creation of a company whose business plan centered on the identification of candidate genes for a number of diseases
  - Three additional groups were pursuing similar approaches for HH gene identification
- **Role of patents in test commercialization**
  - Laboratories without patent rights quickly developed gene tests for the mutations based on information published in a *Nature Genetics* article before the patent issued

## Case Study #5: Hereditary Hemochromatosis

- **How did patent(s) and licensing practices affect price?**
  - Unclear how much variability in price can be attributed to license/royalty fees versus overhead costs or costs associated with different test methodologies or platforms
- **Role of patents and licensing practices in test availability**
  - Patent enforcement did remove pre-existing competition when the patented test first appeared in the testing market (i.e., “clearing the market”)
  - Genetic testing for HH currently appears to be widely available

## Case Study #5: Hereditary Hemochromatosis

- **What is the potential that the patent may cause some future harm?**
  - Issue not addressed

# Case Study #6: Tay-Sachs and Canavan Disease

- **Background:**
  - Recessive neurological conditions that predominantly affect the Ashkenazi Jewish population
    - HexA gene for Tay-Sachs
    - ASPA (aspartoacylase ) gene for Canavan
- **Genetic Testing:**
  - DNA-based carrier screening available for Tay-Sachs and Canavan diseases
    - Highly effective enzyme test (detects 97-98% of carriers) for Tay-Sachs developed in the 1980s

## Case Study #6: Tay-Sachs and Canavan Diseases

- **Patents and Licenses:**
  - HexA gene patented by NIH and never licensed
  - ASPA gene patented by Miami Children's Hospital, with licensing arrangements eventually determined by out of court settlement

# Case Study #6: Tay-Sachs and Canavan Diseases

- **Test Price**

- Full sequence analysis:

- Tay-Sachs                      Average Price \$1,536
    - Canavan                        Average Price \$1,198

- Targeted mutation analysis

- Tay-Sachs                      Average Price \$292
    - Canavan                        Average Price \$298

- Enzyme Assay (TS)/Analyte Test (CD)

- Tay-Sachs                      Average Price \$204
    - Canavan (limited #)        Average Price \$195

## Case Study #6: Tay-Sachs and Canavan Diseases

- **Did prospect of patents encourage search for gene-disease association?**
  - Prospect of patents did not motivate the inventor of the genetic test for Tay-Sachs disease
  - Case study does not address whether Canavan researchers were motivated by the prospect of obtaining a patent
- **Role of patents in test commercialization**
  - Tay-Sachs patent neither helped nor hindered commercialization of the Tay-Sachs gene test
  - Impact of the Canavan patent on commercialization is unclear

## Case Study #6: Tay-Sachs and Canavan Diseases

- **How did patent(s) and licensing practices affect price?**
  - For Canavan disease testing, problems arose with the original licensing scheme, which imposed fees and use restrictions. This scheme was subsequently modified through an out of court settlement.
- **Role of patents and licensing practices in test availability**
  - For Canavan disease testing, problems could have arisen had the original licensing scheme, which imposed fees and use restrictions, remained in place
  - Genetic testing for Tay-Sachs disease is widely available, however the biochemical test is generally preferred

## Case Study #6: Tay-Sachs and Canavan Diseases

- **What is the potential that the patent may cause some future harm?**
  - Highly unlikely that NIH will begin enforcing its patent for the Tay-Sachs gene before the patent expires in June 2010
  - Effect of Canavan disease patents on future clinical access cannot be assessed due to closed settlement
    - Canavan Disease consortium has made public statement that research uses are not subject to liability for infringement

# Case Study #7: Cystic Fibrosis

- **Background:**
  - Recessive disorder that affects ~30,000 Americans
  - Caused by mutations in the CFTR gene
    - $\Delta F508$  mutation present in ~70% of cases
  - Early detection and screening allows for better disease management (no cure)
- **Genetic Testing:**
  - DNA-based carrier and newborn screening is available and endorsed by medical professional societies

# Case Study #7: Cystic Fibrosis

- **Patents and Licenses:**
  - Patents for CFTR gene mutation and methods for detecting them are held by:
    - The University of Michigan
    - The Hospital for Sick Children (Toronto)
    - Johns Hopkins University
  - All patents are nonexclusively licensed



## Case Study #7: Cystic Fibrosis

- **Did prospect of patents encourage search for gene-disease association?**
  - Prospect of patents was not reported as an important incentive for CFTR gene discovery
- **Role of patents in test commercialization**
  - All parties involved (researchers and funders) agreed to pursue patent protection so that broad access to CF genetic diagnostics could be encouraged through nonexclusive licensing strategies
  - No evidence that patent process affected speed of genetic test development, although there were interference proceedings that were not resolved until 2002

## Case Study #7: Cystic Fibrosis

- **How did patent(s) and licensing practices affect price?**
  - Lab-to-lab price comparisons are difficult due to a range in services and mutation panels
  - Cost per amplicon for full gene sequencing is comparable to that of BRCA1/2 testing
  - Non-exclusive licensing practices and test costs do not preclude cost-effective screening and availability of testing from numerous laboratories
- **Role of patents and licensing practices in test availability**
  - Testing is offered by 64 laboratories nationwide
  - No evidence that indicates CFTR gene patents and broad licensing have limited consumer utilization

## Case Study #7: Cystic Fibrosis

- **What is the potential that the patent may cause some future harm?**
  - Development and commercialization of new test techniques and technologies continue for CF genetic testing
  - Broad, nonexclusive licensing practices have allowed for competition as well as innovation
  - Therefore, patents and licensing practices of the CFTR gene most likely will not result in future harms to CF genetic testing

## Case Study #8: Long QT Syndrome

- **DISCLAIMER:**

- The landscape of genetic testing for Long QT Syndrome continues to evolve, and thus the authors of the case study are continuing to update the report
- Slides that follow should not be interpreted as “final” findings

# Case Study #8: Long QT Syndrome

- **Background:**
  - Mendelian condition which can lead to sudden cardiac death
  - Affects 1 in 3,000 newborns
  - Mutations in 12 susceptibility genes account for ~75% of familial LQTS, with mutations in three genes accounting for the vast majority of cases
- **Genetic Testing:**
  - Knowing which mutation an individual has helps guide decisions regarding preventative measures and therapies
  - Testing offered through Clinical Data Inc., a subsidiary of PGx Health™ (FAMILION®), a service launched in 2004
  - Prior to the launch of the FAMILION service, there were at least 2 other fee-for-service providers of genetic testing for LQTS which screened approximately 1/3 of the five genes' combined coding sequence

# Case Study #8: Long QT Syndrome

- **Patents and Licenses:**

- The majority of LQTS susceptibility genes were discovered by a researcher at the University of Utah in the mid-1990s
- The University of Utah Research Foundation exclusively licensed its LQTS patents to DNA Sciences Inc. from 1999-2003
- In 2003, DNA Sciences and all of its assets were purchased by Genaisance Pharmaceuticals
  - Genaisance Pharmaceuticals launched commercial LQTS testing in 2004
- In 2005, Genaisance was acquired by Clinical Data Inc.
- Clinical Data has since overseen the rapid growth in commercial testing for LQTS and related disorders

## Case Study #8: Long QT Syndrome

- **Test Price**

- Testing is offered by Clinical Data, Inc.
  - \$5,400 per patient
  - \$900 per confirmatory test in additional family members

Cost per amplicon ~\$74

## Case Study #8: Long QT Syndrome

- **Did prospect of patents encourage search for gene-disease association?**
  - Prospect of patents did not appear to stimulate a race for gene discovery, most likely because of the relative rarity of LQTS and the presumed small market for LQTS genetic testing
- **Role of patents in test commercialization**
  - Perceived value in LQTS intellectual property, as both Genaissance and Clinical Data appear to have made testing for LQTS a substantive part of their genetic testing business plans
  - Both GeneDX and Boston University offered fee-for-service testing from ~2001 – 2002 before patents were enforced, suggesting that IP was not the only incentive to offer the service

# Case Study #8: Long QT Syndrome

- **How did patent(s) and licensing practices affect price?**
  - FAMILION® LQTS testing costs \$5,400 per index case and \$900 per confirmatory test in additional family members
  - Per amplicon cost is \$74, nearly twice the per-amplicon cost of BRCA1/2 testing
  - Incomplete coverage of test cost by most payers
- **Role of patents and licensing practices in test availability**
  - Enforcement actions of DNA Sciences and perhaps those of Genaissance from 2002-2004 may have adversely affected consumer access to genetic testing for LQTS
    - Concern that there was a period of time during which testing was not available due directly to sole provider enabled by exclusive licensing
  - During this time, there was minimal awareness of genetic testing and poor understanding of LQTS genetics
  - Clinical Data does not offer prenatal genetic diagnosis of LQTS

## Case Study #8: Long QT Syndrome

- **What is the potential that the patent may cause some future harm?**
  - **To date, there is no evidence that the virtual LQTS monopoly has had a stifling effect on development of an improved test**
    - Exception of allelic dropout (occurrence might have been detected sooner if there were multiple laboratories performing the test)
  - **Clinical Data has been criticized for its difficulty in processing paraffin-embedded samples from deceased individuals**
    - Rarely done in clinical settings for any genes

## Case Study #8: Long QT Syndrome

- **What is the potential that the patent may cause some future harm? (continued)**
  - **Clinical Data has declined to add genes to its LQTS testing panel or sublicense rights to its panel to other companies due to the rarity of the mutations in the other genes**
    - Currently tests for mutations in five genes
    - Rarer mutations in seven other genes known to predispose to LQTS
    - This is not unique to LQTS and cannot be linked directly to patent/license issues, being a common dilemma in the setting of genetically heterogeneous disorders
  - **Case has become complicated by exclusive licensing of different loci to different licensees**
    - Resolution of this situation is not yet clear

# Preliminary Conclusions

# Preliminary Conclusions

- **It is not so much whether a genetic diagnostic test is patented or unpatented, but rather how the patents are used and enforced that result in barriers to clinical access.**
  - Findings from the case studies suggest that it is the use and enforcement of intellectual property rights that affect clinical access
  - Controversies are more likely to occur when the interests of medical practitioners and patients are not taken into consideration during the licensing process and when exclusive licenses are issued

# Preliminary Conclusions

- **There is no clear relationship between patents, license exclusivity, and price of a genetic diagnostic test.**
  - Evidence from case studies did not reveal exorbitant patent premiums for genetic diagnostic tests that were patented and exclusively licensed relative to tests that were either unpatented or non-exclusively licensed.

# Preliminary Conclusions

- **Thus far, there is no strong evidence of large-scale and long-term barriers to clinical access to genetic tests within the current gene patenting and licensing landscape.**
  - Case studies document several instances in which access to genetic tests may have been impeded due to:
    - Sole provider not offering test for a period of time
    - Disagreement regarding test cost and royalty payments
    - Inability to combine services for testing multiple mutations.
    - Problems arising from lack of contract between sole provider and major payer

# Preliminary Conclusions

- **At the same time, there is also no evidence that gene patents and exclusive licensing practices provide powerful incentives for the development or availability of genetic diagnostic tests.**
  - In contrast to the situation for the development of therapeutics, the threshold for developing diagnostics is low and clinical need (and academic interest) serve as the predominant drivers for the development of genetic tests
  - It is evident that in most cases, diagnostic tests are quickly offered without the need for patents and exclusive licensing (e.g., CF, Hemochromatosis, BRCA, colon cancer, hearing loss)
  - The incentive structure could change as the regulatory environment for genetic tests evolves
  - Patenting does not seem to be required for driving discovery of genetic associations or for proliferation of clinical laboratories which offer a given test.

# The Purpose of Patents and Licensing

- The question arises as to the purpose of gene patents and licensing
  - Are they an inherent right or should they exist to accomplish a positive goal?
- How does patenting in healthcare differ from patenting in purely commercial arenas?
  - i.e., is healthcare the same as a widget?
  - Bills like Ganske-Frist imply that we hold different views about healthcare issues when it comes to patents and licensing
- Is the patenting of diagnostics inherently different from other uses of patents?
  - Since diagnostics elucidate something about an individual, is it relevant to ask whether discovering that information through a diagnostic test should be treated differently?

# Preliminary Conclusions

- **Regulation of intellectual property rights may not necessarily be the optimal primary point of action for resolving problems regarding quality of genetic testing.**
  - Intellectual property rights and their application are sometimes mentioned with regard to quality issues. They are not necessarily the areas to focus on first when looking for remedies.
  - Issues related to quality might be better addressed through evaluation of the regulation and oversight of genetic tests, as well as coverage and reimbursement systems for such services.

# Preliminary Conclusions

- **The field of genetic testing is rapidly evolving, and the existing landscape of patents and exclusive licenses may cause significant problems in the future.**
  - Most diseases with a genetic component are genetically heterogeneous which necessitates multiplex testing
  - Technology is rapidly moving towards the ability to engage in robust deep genomic analysis
  - Patent thickets may become more of a logistical problem as multiplexed testing increases.
  - Full genome sequence analysis represents a serious challenge to the current system of patents on individual genes and exclusive licenses.

# Preliminary Conclusions

- **The field is opaque.**
  - It is difficult to assess the current landscape of gene patents for diagnostic purposes and associated licenses and whether these intellectual property rights are directly affecting clinical and patient access to diagnostic genetic tests
  - The lack of transparency has implications as well for the future of multiplex testing (i.e. how does a potential provider know if their envisioned test infringes on another's rights?)

# A Range of Potential Policy Options

- A range of policy options have been identified for consideration by the public in order to address concerns regarding the patenting and licensing of genes and DNA sequences and potential future effects on patient access
- Divided into eight categories depending on:
  - Nature of Action
  - How change would be effected
  - Entity to whom the recommendation is directed

# Categories of Potential Policy Options

1. Advocacy Efforts by Key Stakeholders to Ensure Access
2. Enhancing Transparency in Patents and Licensing
3. Filling Data Gaps
4. Federal Efforts to Promote Broad Licensing and Patient Access
5. Licensing Policies Governing Federally Funded Research to Facilitate Access
6. Study Federal Implementation of IP Laws
7. Improving and Clarifying PTO Policy
8. Seeking Statutory Changes

# Why Present a Range of Potential Policy Options?

- Presenting a range of options to the public will help identify public perspectives on potential remedies
- Public perspectives will help guide formulation of final recommendations to the Secretary

# Policy Options: A Plea for Balance

- The patent system generally works well
- Thus we should be mindful of unintended consequences that could result from suggested changes
- On the other hand, if there are problems or likely future problems, it is not unreasonable to recommend judicious policy changes
- The key is balance--we need a proportional response to identified problems

# Discussion Questions for the Following Draft Options

- Are there policy options that should be added, removed, or modified prior to releasing the draft report for public comment?
- Is the range of policy options presented supported by the preliminary findings?
- Are there any other issues that need to be addressed in the report before it is released for public comment?
- Overall, and with the understanding that further editing may be needed, is the draft report ready to be released for public comment in early 2009?

# Draft Policy Options for Consideration

## 1) **Advocacy Efforts by Key Stakeholders to Ensure Access**

- A. In order to optimize patient access to and the quality of genetic tests, stakeholders (e.g., industry, academic institutions, researchers, patients) should work together to develop a code of conduct to encourage broad access to technologies through licensing agreements for the diagnostic use of gene patents.
- B. When different stakeholders (e.g., academic researchers, industry, and patient organizations) work together to advance the identification of gene mutations and the development of diagnostic tests, the owner of any resulting invention should consult with those stakeholders regarding whether to seek patent protection and how any resulting patent should be licensed.

# Draft Policy Options for Consideration

## 1) **Advocacy Efforts by Key Stakeholders to Ensure Access**

- C. Professional associations involved in technology transfer policy and practice should embrace and promote the principles reflected in NIH's *Best Practices for the Licensing of Genomic Inventions*; the OECD *Guidelines for Licensing of Genetic Inventions*; and AUTM's *In the Public Interest: Nine Points to Consider in Licensing University Technology*. They also should work together to build on those norms and practices as they relate to gene based diagnostics by articulating more specific conditions under which exclusive licensing and nonexclusive licensing of uses relevant to genetic testing are appropriate. Professional societies should work cooperatively to forge consensus positions with respect to gene patenting and licensing policies.

# Draft Policy Options for Consideration

## 2) Enhancing Transparency in Patents and Licensing

- A. Holders of patents on genes, genetic tests, and related technologies, including academic institutions and companies, should make their patent licenses (or information about their licenses, including such factors as the type of license, field of use, and scope) on those patents publicly available.
- B. As a means to enhance public access to information about the licensing of patents related to gene-based diagnostics, the NIH should amend the *Best Practices for the Licensing of Genomic Inventions* to encourage licensors and licensees to include in their license contracts a provision that allows each party to disclose information about their licenses (including such factors as type of license, field of use, and scope).

# Draft Policy Options for Consideration

## 2) **Enhancing Transparency in Patents and Licensing**

- C. The Secretary of HHS should seek statutory authority to enable the Food and Drug Administration and the Centers for Medicare and Medicaid Services to require patented DNA-based in vitro diagnostic tests, whether offered as a test kit or a laboratory developed test, to display on product packaging and/or company/provider websites the issued patent and published patent numbers that the company or provider owns and controls and reasonably believes covers their product or patents licensed by the company/provider in order to market the product.

# Draft Policy Options for Consideration

## 3) Filling Data Gaps

- A. In order to assess the extent to which gene patent or licensing arrangements may be affecting patient access to genetic tests, HHS should develop a voluntary reporting system to encourage researchers and medical practitioners who order, use, or perform genetic tests to report such access problems.

Given that patient access problems can occur for a number of reasons, it would be important for the reports to be verified and evaluated to be sure they can be attributed to the gene patent or licensing arrangements. For example, the reports may need to include evidence of patent enforcement actions, such as a cease and desist letter. It may be prudent to pilot test and evaluate such a system through a demonstration program before committing to its full development.

# Draft Policy Options for Consideration

## 3) Filling Data Gaps

- B. Under the Bayh-Dole Act, recipients of federal grants, cooperative agreements, and contracts are required to report to federal agencies about inventions that result from federally funded research. Such reports are submitted through an on-line information management system called iEdison. The reports are considered proprietary and are not publicly available. NIH also requires recipients of NIH funding, upon election of title to an invention, to report utilization data annually for that invention, including whether and how many exclusive and non-exclusive licenses have been granted (if any).

Research agencies should explore using summary data from their respective federal fund agreements as a tool to help assess the extent to which exclusive licensing practices of identified patents may play a role in inhibiting patient access to diagnostic gene based inventions. NIH also should explore whether iEdison data could be used to assess whether the licensing of genomic inventions has been conducted in accordances with the NIH *Best Practices for the Licensing of Genomic Inventions*.

# Draft Policy Options for Consideration

## 3) Filling Data Gaps

- C. More data are needed to understand the landscape of gene patenting and the licensing arrangements that are being used to commercialize the inventions.

The Secretary of HHS should develop a uniform system for data collection, including database structure and standardized terminology, or enhance the existing iEdison system, and encourage HHS funding recipients to submit more data about inventions that, at the time they are patented and licensed, are reasonably anticipated to be associated with clinical genetic tests. The data elements that would be most useful are:

- 1) whether the licensor of the invention granted the licensee the rights to make and sell a clinical genetic test or provide a clinical service;

(continued)

# Draft Policy Options for Consideration

## 3) Filling Data Gaps

C. (continued):

- 2) the nature of the licensing agreement (e.g., exclusive, co-exclusive, nonexclusive) and for licenses with some degree of exclusivity in the grant, information about the grant of license rights (i.e., field(s) of use, scope) and whether or not the license has non-financial performance incentives (diligence);
- 3) patent and license timelines (dates of patent filing, publication, issuance, and license effective dates);
- 4) the date of first reported sale of the genetic test or service, and periodic notations of whether the test or service remains on the market; and
- 5) if possible, some measure of volume of sales (in number of tests or kits sold), even if such sales are not royalty bearing.

Providers of the data should be consulted about the design of the database, the development of its standard terminology, and their perspectives on the burden and implications of reporting such data.

# Draft Policy Options for Consideration

## 3) Filling Data Gaps

- D. The Secretary of HHS should establish an advisory board to provide ongoing advice about the public health impact of gene patenting and licensing practices. The board could review new data collected on patient access problems and assess the extent to which they are caused by enforcement of intellectual property rights. The advisory board also could provide input on the implementation of any future policy changes, including any that might emerge as a consequence of this report.

# Draft Policy Options for Consideration

## 4) Federal Efforts to Promote Broad Licensing and Patient Access

- A. Federal agencies, including NIH, should promote wider adoption of the principles reflected in NIH *Best Practices for the Licensing of Genomic Inventions* and the OECD *Guidelines for Licensing of Genetic Inventions*, both of which encourage limited use of exclusive licensing for genetic/genomic inventions.
  
- B. Federal agencies, including NIH, should encourage wider use of AUTM's *In the Public Interest: Nine Points to Consider in Licensing University Technology*. Points two and nine are particularly relevant for genetic tests. They state, in part, that “exclusive licenses should be structured in a manner that encourages technology development and use” and in licensing arrangements, institutions should “consider including provisions that address unmet needs, such as those of neglected patient populations” giving particular attention to improved diagnostics<sup>120</sup> among other technologies.

# Draft Policy Options for Consideration

## 4) Federal Efforts to Promote Broad Licensing and Patient Access

- C. NIH should explore whether mechanisms such as patent pooling could facilitate the use of rapidly developing technologies for genetic tests that are dependent upon multiple licenses of patents.
- D. Federal agencies should consider providing more detailed guidance for gene-based clinical diagnostic inventions to encourage academic institutions to use terms in licensing agreements, such as due diligence clauses, to foster the availability and quality of clinical diagnostic tests and, thereby, reduce the likelihood that exclusivity associated with a license would lead to adverse effects on patient access. Taking steps likely to increase the number of insurers that reimburse for the test, or improving the specificity and sensitivity of the test and enhancing knowledge of its clinical validity are examples of milestones that a licensee could be required to meet to earn or maintain license rights.

# Draft Policy Options for Consideration

## 5) **Licensing Policies Governing Federally Funded Research to Facilitate Access**

- A. NIH should explore the feasibility of making compliance with the NIH *Best Practices for the Licensing of Genomic Inventions* an important consideration in future grants awards.
- B. The Secretary of HHS should request an Executive Order clarifying the authority of HHS under the Bayh-Dole Act to ensure that the goals of the statute are being fulfilled in the context of genetic diagnostic tests, in the manner reflected in the NIH *Best Practices for the Licensing of Genomic Inventions*.
- C. The Secretary of HHS should request an Executive Order clarifying the authority of HHS under the Bayh-Dole Act to require a grantee or contractor to offer only non-exclusive licensing of DNA-based inventions for diagnostic fields of use, e.g., by making the requirement a term and condition of award!<sup>22</sup>

# Draft Policy Options for Consideration

## 6) **Study Federal Implementation of Intellectual Property Laws**

- A. The Secretary of HHS, in collaboration with other departments, should commission a study to evaluate and compare how federal agencies have managed government owned DNA-based inventions with diagnostic fields of use.
- B. The Secretary of HHS, in collaboration with other departments, should commission a study of how agencies have interpreted and applied the Bayh-Dole Act with respect to the application of the statute's march-in provisions.

# Draft Policy Options for Consideration

## 7) Improving and Clarifying U.S. Patent and Trademark Office (USPTO) Policy

The Secretary of HHS should recommend that the Secretary of Commerce advise USPTO to:

- A. Establish an advisory committee to provide advice about scientific and technological developments related to genetic tests and technologies that may inform its examination of patent applications and other proceedings;
- B. Gather together in a manner analogous to the Utility Guidelines, nonobviousness guidelines to assist USPTO personnel in examining patent applications on nucleic acids and genetic diagnostics, and particularly those applications seeking patent protection for human DNA sequences and/or genes for diagnostic purposes analogous to the Utility Guidelines published in 2001;
- C. Develop guidelines on the patentable subject matter in the wake of *In re Bilski* and its progeny.

# Draft Policy Options for Consideration

## 8) Seeking Statutory Changes

The Secretary of HHS should work within the Administration to encourage support for legislative change. The following are potential options to consider.

- A. Prohibit patenting of an association of a particular genotype with a disease/disorder.
- B. Modify the Patent Act as necessary to expressly withhold the right of injunctive relief from patent holders or their licensees who are impeding patient access to a genetic diagnostic test.

# Draft Policy Options for Consideration

## 8) Seeking Statutory Changes

The Secretary of HHS should work within the Administration to encourage support for legislative change. The following are potential options to consider.

**C1. Create an exemption from patent infringement liability for medical practitioners who order, use, or perform diagnostic genetic tests in clinical care. Related health care entities should also be covered by this exemption**

**C2. Create an exemption from patent infringement liability for those who order, use, or perform diagnostic genetic tests in the pursuit of research. Related health care and research entities should also be covered by this exemption.**

# Draft Policy Options for Consideration

## 8) Seeking Statutory Changes

The Secretary of HHS should work within the Administration to encourage support for legislative change. The following are potential options to consider.

D1. Require that patents on DNA sequences be limited to the utilities specified in the patent.

**OR**

D2. Prohibit patents on DNA sequences for diagnostic purposes.

**OR**

D3. Prohibit patents on DNA sequences.

# Discussion Questions

- Are there policy options that should be added, removed, or modified prior to releasing the draft report for public comment?
- Is the range of policy options presented supported by the preliminary findings?
- Are there any other issues that need to be addressed in the report before it is released for public comment?
- Overall, and with the understanding that further editing may be needed, is the draft report ready to be released for public comment in early 2009?

# Next Steps

- **Today** – Discuss draft consultation report
- **December** – If approved, Task Force will ready revised draft for public release

# Next Steps

- **February - April 2009** –Public comment period.
- **April - May 2009** – Analysis of public comments; Task Force discussion of public comments.
- **June 11-12, 2009** – SACGHS Meeting. Discuss preliminary findings from public comment period.
- **Summer 2009** – Revision of draft report to incorporate public comment period.

# Next Steps

- **October 8-9, 2009** – SACGHS Meeting
  - Discussion of final draft report and recommendations
  - Vote to approve for transmission of final report to the HHS Secretary



