Sponsors
Taube Center for Jewish Studies
Department of Biology

Co-sponsors
Center for Comparative Studies in Race and Ethnicity
Ecology & Evolution Group, Department of Biology
Morrison Institute for Population and Resource Studies
Stanford Center for Population Research, Institute for Research in the Social Sciences
Stanford Continuing Studies
Course themes

• Genetic relationships among Jewish populations

• Interactions between cultural and biological views about Jewish ancestry

• Origin and history of Jewish genetic diseases
DEFENDERS OF THE RACE
JEWISH DOCTORS & RACE SCIENCE IN FIN-DE-SIÈCLE EUROPE
JOHN M. EFRON
special issue
(approx. Oct 2013)

From Generation to Generation: the Genetics of Jewish Populations

Noah Rosenberg & Steve Weitzman, editors
Identifiability of Ashkenazi ancestry

AC Need et al. (2009)
*Genome Biol* 10: R7
Genetic relationships among Jewish and non-Jewish populations

DM Behar et al. (2010)
Nature 466: 238-242
Applications of genetic ancestry studies in Jewish populations

• Historical population migrations

• Endogamy in recent generations

• Personal genomics

• Reducing confounding in genetic disease association studies

• Identifying unknown samples
Genetic relationships among Jewish and non-Jewish populations

NM Kopelman et al. (2009)
BMC Genet 10:80
Population genetics of human embryonic stem cell lines

Number of posters at the 2010 conference of the International Society for Stem Cell Research

CT Scott et al. (2010)
Nature Methods 7:866-867
Population genetics of human embryonic stem cell lines

JT Mosher et al. (2010)  
Population genetics of human embryonic stem cell lines

Number of posters at the 2010 conference of the International Society for Stem Cell Research

CT Scott et al. (2010)
Nature Methods 7:866-867
Course themes

- Genetic relationships among Jewish populations
- Interactions between cultural and biological views about Jewish ancestry
- Origin and history of Jewish genetic diseases
Views of Jewish genetics affect reproductive technologies

How do you conceive a Jew?
- With a Jewish egg?
- Or via a Jewish womb?
Culturally distinct population may have co-occurred with a genetically distinctive type
Cultural association with a disease enabled reduction of the disease frequency

Annual number of Tay-Sachs cases in the United States and Canada

MM Kaback et al. (2001) 
Adv Genet 44: 253-265
Course themes

• Genetic relationships among Jewish populations

• Interactions between cultural and biological views about Jewish ancestry

• Origin and history of Jewish genetic diseases
Genetic diseases in the Ashkenazi population

- Bloom Syndrome
- Breast Cancer
- Colon Cancer
- Canavan Disease
- Deafness
- Cystinuria
- Dysautonomia
- Factor XI Deficiency
- Familial Hyperinsulinism
- Familial Hypercholesterolemia
- Fanconi Anemia Type C
- Galactosidase Deficiency
- Gaucher Disease
- Glycogenesis type 7
- Mucolipidosis type IV
- Niemann-Pick Disease
- Tarui Disease
- Tay-Sachs Disease
- Torsion Dystonia
- Parkinson Disease
Why does the Ashkenazi population have so many diseases?

- Spurious consequence of racialized science during a key period in medical history
- Natural selection favoring unknown positive effects of disease mutations
- Founder effects, endogamy, and consanguinity
Runs of homozygosity (ROH) and tracts of identity-by-descent (IBD)
Runs of homozygosity are elevated by bottlenecks and consanguinity

TJ Pemberton et al. (2012)
Am J Hum Genet 91: 275-292
Long runs of homozygosity are elevated by consanguineous unions

Rosenberg Lab

TJ Pemberton et al. (2012)
Am J Hum Genet 91: 275-292
Jewish populations have elevated identity by descent

<table>
<thead>
<tr>
<th>Population</th>
<th>Measurement of pairwise genomic sharing (cM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashkenazi Jewish</td>
<td>23.0</td>
</tr>
<tr>
<td>Sardinian</td>
<td>12.4</td>
</tr>
<tr>
<td>Finnish</td>
<td>10.0</td>
</tr>
<tr>
<td>Tuscan</td>
<td>9.3</td>
</tr>
<tr>
<td>Italian</td>
<td>0.1</td>
</tr>
</tbody>
</table>

BM Henn et al. (2012)
*PLoS One* 7: e34267
Jewish populations have elevated identity by descent
Why does the Ashkenazi population have so many diseases?

1. The history of the Ashkenazi Jewish population produced elevated genomic sharing

2. Genomic sharing predicts the occurrence of deleterious mutations

3. Some of those mutations are expected to be disease-causing, others to confer disease risk
Course themes

• Genetic relationships among Jewish populations
  • Many Jewish populations do share distinctive multivariate genetic signatures

• Interactions between cultural and biological views about Jewish ancestry
  • Views on Jewish genetics matter to practical personal decisions

• Origin and history of Jewish genetic diseases
  • Modern genomics provides a framework for explaining Jewish genetic disease risks