### The Concept of Race

#### Definitions of Race

- **Dobzhansky: (1944:52)** Races are defined as populations differing in the incidence of certain genes, but actually exchanging or potentially able to exchange genes across whatever boundaries (usually geographic) separate them
  - Race differences are objectively ascertainable facts; the number of races we choose to recognize is a matter of convenience (1962:266)

- **Boyd: (1950:207)** We may define a human race as a population which differs significantly from other human populations in regard to the frequency of one or more of the genes it possesses
  - It is an arbitrary matter which, and how many, gene loci we choose to consider as a significant "constellation" . . .

#### Definitions of Race

- **Hulse: (1963:262)** . . . races are populations which can be readily distinguished from one another on genetic grounds alone
- **Vogel and Motulsky: (1986:534)** A race is a large population of individuals who have a significant fraction of their genes in common and can be distinguished from other races by their common gene pool

- **Garn: (1960:7)** At the present time there is general agreement that a race is a breeding population, largely if not entirely isolated reproductively from other breeding populations
  - The measure of race is thus reproductive isolation, arising commonly but not exclusively from geographical isolation

### Race

- The term *race* was applied to varieties of *Homo sapiens* in the middle of the eighteenth century by Buffon
  - Prior to this time, *race* described breeds of domestic animals, their group membership or descent from a common ancestor
Definitions of Race

• Baker (1967:21) It is concluded that race may be defined as a rough measure of genetic distance in human populations and as such may function as an informational construct in the multidisciplinary area of research in human biology

• Brues (1977:1-2) A race is a division of a species which differs from other divisions by the frequency with which certain hereditary traits appear among its members
  – Among these traits are features of external appearance that make it possible to recognize members of different populations by visual inspection with greater or less accuracy
  – Members of such a division of a species share ancestry with one another to a greater degree than they share it with individuals of other races
  – Finally, races are usually associated with particular geographic areas

• Mayr (1963): considers the major divisions of humankind to be subspecies, which are aggregations of local populations of a species inhabiting geographic subdivisions of the range of the species and differing taxonomically from other populations of the species

• E.A. Hooton (1926): A race is a great division of mankind, the members of which, though individually varying, are characterized as a group by a certain combination of morphological and metrical features [which ones?], principally non-adaptive, which have been derived from their common descent.

• Mayr (1963): Biological races are non-interbreeding sympatric populations that differ in biological characteristics but not, or scarcely, in morphology
  – He points out that human races do not experience such limitation of interbreeding

HOW MANY RACES?

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of Races</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linnaeus</td>
<td>4: European, Asian, African, Amerindian (+3 imaginary)</td>
</tr>
<tr>
<td>Blumenbach</td>
<td>5: Caucasian, Mongoloid, Malay, Ethiopian, American</td>
</tr>
<tr>
<td>Hooton</td>
<td>3: White, Negroid, Mongoloid; 11 “Primary Subraces” like Alpine</td>
</tr>
<tr>
<td>Garn (1965)</td>
<td>9: Amerindian, Polynesian, Micronesian, Melanesian-Papuan, Australian, Asiatic, Indian, European, African Local Races defined as breeding populations (e.g., Hindu) Microraces like neighborhoods</td>
</tr>
</tbody>
</table>
Failure of the Race Concept

• The classification [of humans] into races has proved to be a futile exercise for reasons that were already clear to Darwin (Cavalli-Sforza et al., 1994)
  – While it is clear that there is only one human species, there are no objective reasons for splitting or lumping at any lower taxonomic level (i.e., subspecies, races, varieties)

Alternatives to the Race Concept

• Clines: the distribution of allele frequencies over space.
  – The more loci considered simultaneously, the more the cline is likely to reflect the genetic history of the group
• Cavalli-Sforza et al. (1994) have plotted a color map based on 120 allele frequencies in 42 populations

Ethnicity

• The emphasis of culture over biology
• Ethnic groups are formed by virtue of community of language, religion, social institutions, etc., which have the power of uniting human beings of one or several species, races, or varieties and are by no means zoological species (Deniker 1900)

Ethnic Group

• When one uses the term ‘ethnic group,’ the question is immediately raised, ‘What does it mean? What does the user have in mind?’ And this at once affords an opportunity to discuss the facts and explore the meaning and falsities enshrined in the word ‘race’ and to explain the problems involved and the facts of the genetic situation as we know them. (Montagu 1962)
Ethnic Group

- Ethnicity is a multifactorial concept including, but not limited to, cultural constructs, genetic background, ecological specialization, and self-identification. (After Crews and Bindon 1991)

Recent Events

- 2000 census revived racial politics
  - Racial categories: big policy debate over the choice between multiracial category and multiple categories
    - AAA supports choosing more than one
    - Also supports ethnicity (cultural) over race (biological) categories
    - Implications of people’s choices determine where the money goes
    - More people choosing multiracial or multiple categories means less money for specific minority projects
  - Sampling versus actual count
    - Most difficult people to count are poor, minorities, who, if they vote, are likely to vote Democratic
    - Congress controlled by Republicans prefers actual count which will undercount these groups
    - Sampling is being used by many states for official allocation of funds but the federal government is refusing to accept this approach

Updating Differential Worth

- 18th and 19th Century anthropologists attempted to rank groups of people on the basis of skull size and shape, brain volume, and other measures
- In the 20th Century we have replaced these other measurements with “intelligence testing”
  - Conclusions about racial rankings based on measurements such as IQ scores

Race and IQ

- The book, The Bell Curve in 1994 revived racial ideology to explain IQ score differences
- Carl Brigham (1920s) of the College Entrance Examination Board
  - The IQ of migrants to the U.S.
    - Non-literate vs. literate comparisons
  - Genes versus environmental influences
  - Immigration Restriction Act of 1924

Race and IQ

- Sir Cyril Burt
  - Social Class and Intelligence
    - Intelligence tracks within British social classes
  - Monozygotic (identical) twins reared apart
    - Experiments allegedly show very high heritability for IQ scores (up to 80% of variability due to genes)
  - Scientific fraud
    - Can’t tell what parts of his research are true, but he greatly increased his sample size without changing any of his correlations—a statistical impossibility.

The Fallacy of Heritability

- Heritability is a measure of the degree of genetic determination of a characteristic within a given population
  - Heritability gives NO indication of the genetic basis of differences between populations
  - E.g., Black versus White differences on IQ scores could be due entirely to environment, in spite of studies (like Burt’s) indicating a high heritability of IQ scores within populations
Polymorphism

- A polymorphism (literally many forms) is a genetic locus with two or more alleles that occur in appreciable (>1%) frequency in a given population
- Polytypy refers to a species that consists of populations or aggregates of populations that differ morphologically from one another

ABO Blood Group

- The first recognized human polymorphism was the ABO blood group discovered by Landsteiner in 1900 in an attempt to understand severe complications with some blood transfusions
- The ABO system is one of several Red Blood Cell (RBC) antigen systems, controlling the configuration of molecules on the exterior of the RBC wall
  - Coded for on the ninth chromosome pair
**ABO Blood Group**

- Antibodies and antigens are complementary units of the immune system
  - Function is to protect the body from foreign substances and recognize self vs. other
- Antibodies are substances the body creates in response to an invading substance
- Antigens are the part of the invading substance that invoke the antibody reaction

**ABO Antigens on RBC Wall**

<table>
<thead>
<tr>
<th></th>
<th>O</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>--</td>
<td>Acetylgalactosamine</td>
<td>Galactose</td>
</tr>
<tr>
<td>Fucose-Galactose</td>
<td>Fucose-Galactose</td>
<td>Fucose-Galactose</td>
<td></td>
</tr>
<tr>
<td>Acetylgalactosamine</td>
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<td></td>
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<tr>
<td>Acetylgalactosamine</td>
<td>Acetylgalactosamine</td>
<td>Acetylgalactosamine</td>
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</table>

**The ABO System**

<table>
<thead>
<tr>
<th>Phenotype</th>
<th>Genotypes</th>
<th>Antigens</th>
<th>Antibodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>AA, AO</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>B</td>
<td>BB, BO</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>O</td>
<td>OO</td>
<td>None</td>
<td>A, B</td>
</tr>
<tr>
<td>AB</td>
<td>AB</td>
<td>A, B</td>
<td>None</td>
</tr>
</tbody>
</table>

**ABO Blood Group**

- Normally antibodies are not present in the blood until a foreign substance (like a disease organism) is encountered
- ABO antibodies are present in the blood from the fetal formation of the circulatory system

**Related loci on Chromosome 19**

- H locus produces precursor (O substance)
  - Precursor is dominant
- Se locus causes the antigens to be secreted in saliva and other mucous secretions
  - Secretion is dominant
- Lewis locus produces antigens on RBC and in mucous secretions
  - expression depends on H and Se genes

**Geographic Distribution of ABO**

(see maps)

- O ranges from 80% - 100% in some Native American populations
- B ranges up to 30% in some Asian populations (particularly in the Himalayas)
- A ranges up to more than 50% in some Native Americans and Australian Natives
Causes of Distribution of ABO

- Genetic Drift
  - Random effects probably account for the 100% frequency of O in some Native South American groups and the 50+% frequency of A in Australian and Native American populations
  - Gene Flow
  - The relatively small differences between neighboring groups are probably due to gene flow between populations

Causes of Distribution of ABO

- Selection
  - Some infectious disease organisms have ABO antigens on their cell walls, conferring some resistance on individuals who manufacture the appropriate antibodies, and increasing the susceptibility of people whose blood type matches the antigens

ABO Disease Associations

<table>
<thead>
<tr>
<th>Antigens</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Syphilis</td>
</tr>
<tr>
<td></td>
<td>Smallpox</td>
</tr>
<tr>
<td>B</td>
<td>Infantile diarrhea</td>
</tr>
<tr>
<td></td>
<td>Typhoid fever (not typhus)</td>
</tr>
<tr>
<td>O</td>
<td>Bubonic Plague</td>
</tr>
</tbody>
</table>

Selection and Distribution of ABO

- Himalayan region has peak frequencies of B
  - The area has a history of epidemics of smallpox and bubonic plague
  - These epidemics would select against individuals with blood types A and O, respectively
  - The result would be unusually high frequencies of B, as is the case
Rhesus Blood Group

- The Rhesus (Rh) blood group is a complex genetic trait that determines the “positive” or “negative” part of your blood type
  - An "A positive" (A+) blood type means phenotype A for ABO and phenotype positive for the Rhesus blood group
- We’ll treat Rhesus like a two allele system with positive (D) being dominant and negative (d) being recessive

Rhesus Blood Group

- Unlike the ABO system, antibodies to Rh+ do not normally occur unless an Rh- individual is exposed to Rh+ blood
- An Rh- mother can get exposed to Rh+ blood if she is carrying an Rh+ fetus (D allele coming from the father), but the exposure only occurs at birth when there can be a backflow of fetal blood

Rhesus Blood Group

- If an Rh- mother carries an Rh+ fetus after being exposed to Rh+ blood, the fetus is susceptible to severe health effects and frequent fetal death from erythroblastosis fetalis (literally the breaking down of fetal blood cells)
  - Immune suppressing drugs given to the Rh- mother at birth of an Rh+ infant can avoid this condition

Maternal-Fetal Incompatibility

- Incompatibility occurs when the mother manufactures antibodies to her fetus’ blood groups (e.g., Rh- mother and Rh+ fetus)
  - The red blood cells do not pass through the placental wall, but the antibodies do, and they can attack and agglutinate the fetal red blood cells just as occurs when the wrong blood type is given in a transfusion

Maternal-Fetal Incompatibility

- Considering ABO and Rhesus, the likelihood of the fetus to survive without medical intervention would be:
  - highest for no incompatibilities
  - intermediate for double (both ABO and Rh) incompatibilities
    - ABO reaction probably takes RBC out of circulation before Rh problems develop
  - lowest for ABO or Rh incompatibility