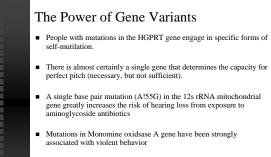
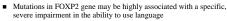
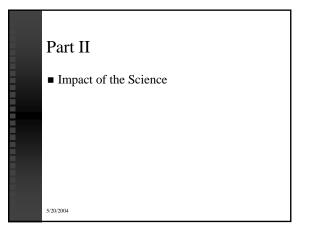


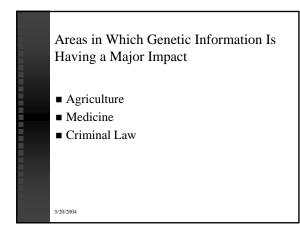
The DNA Paradox Your DNA is 99.9 percent the same as that of the person next to you The .1 percent difference is immensely important It means we differ at 6 million letters We are both very alike and very different

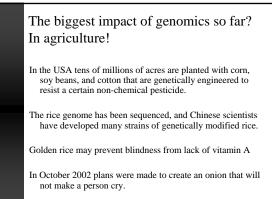




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Areas Which May Experience High Genomic Impact Over the Next Decade

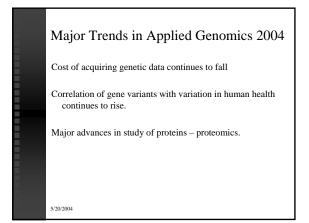
- Public Health: expanded newborn screening
- Employment (discovery of genes influencing occupational diseases)
- Life Insurance (discovery of gene variants highly associated with differential life expectancy)
- Religion (genetic engineering, cloning, preimplantation diagnosis, selective abortion)
- Education (discovery of alleles that influence educability)

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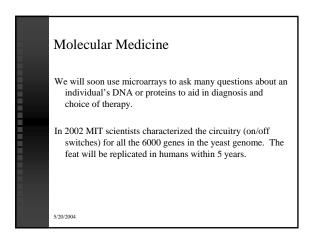
Key Challenge in Medicine: Understand the role of gene variants in common disorders Diabetes has reached epidemic proportions, largely due to overweight and lack of exercise. Yet the best predictor or

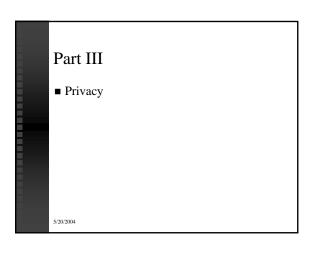
- risk is family history Alzheimer's disease is epidemic – apparently merely as a
- result of increased life expectancy. Yet, the best predictor of risk (currently) is ApoE genotype.
- Cancer is a set of genetic diseases. All cancers arise due to a set of mutations in a single cell

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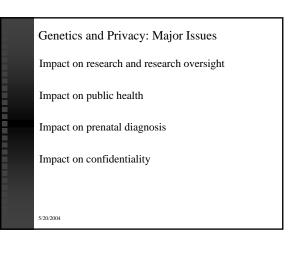


Impact of Trends in Applied Genomics 2004 Medicine - New diagnostic tools (microarrays) Emergence of pharmacogenetics Progress in behavioral genetics Pharmaceutical Industry - Drug development Agriculture - Genetically engineered crops to improve yields Nutrition – Food industry becoming interested in nutritional genomics as a new approach to wellness





Some Ethical Issues in Genomic Medicine Moral status of fetus and embryo Prenatal diagnosis and selective abortion Therapeutic cloning Carrier screening Impact on parenting GENETIC PRIVACY Impact of risk assessment testing Long term storage of DNA and related data Forensic DNA data banks Gene therapy Safety issues Informed consent



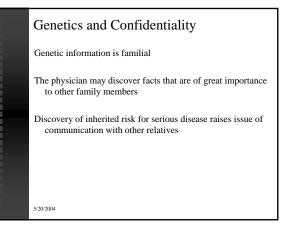
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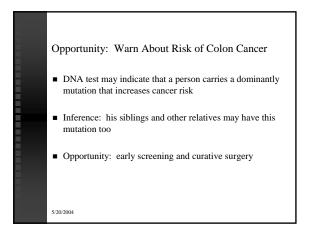
Impact on Public Health Context: Probable expansion of Newborn Screening to include DNA testing. An NIH funded study in Missouri is currently sequencing a gene in more than 20,000 newborns. This could (should?) lead to state based storage of DNA test results

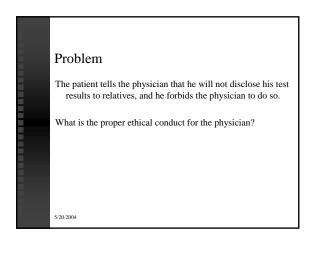
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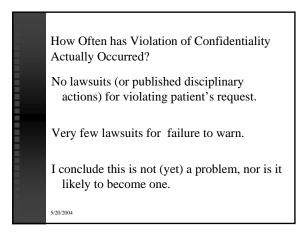
Prenatal Diagnosis: What is a Serious Genetic Disorder?
From1965 to 1995 the number of live born children with spina bifida in England and Wales declined by 95 percent.

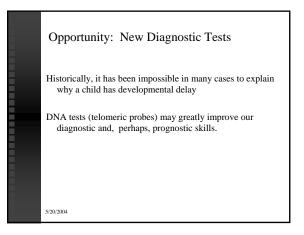
- This was because of a screening test that could identify women with "high risk" pregnancies. Most women who learned of the diagnosis terminated the pregnancy.
- For most fetuses with spina bifida we cannot predict the severity of medical problems.

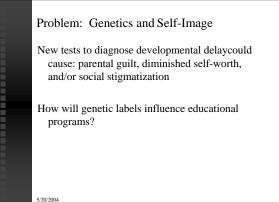


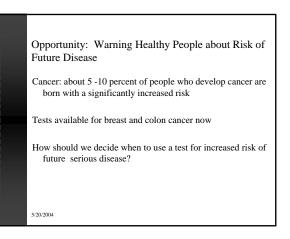


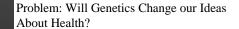






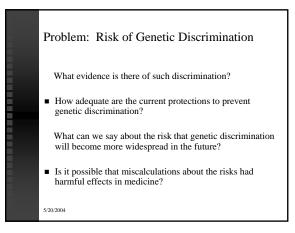


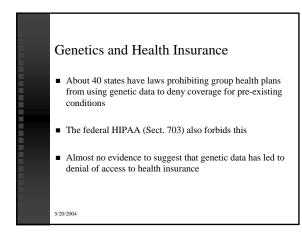


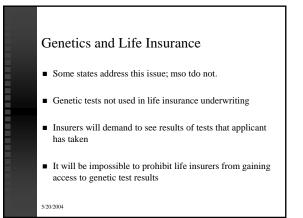


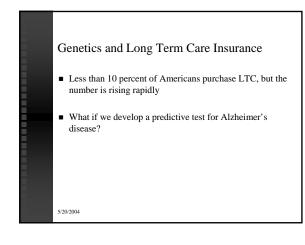
- Is a person who carries a mutation that increases his or her risk for a disease or disorder healthy or ill?
- Consider: a 42 year old woman seeks oophorectomy because of her family history of ovarian cancer. Her insurer refuses to pay for the surgery because it was not performed to treat a "bodily disease." Should she be reimbursed? (Katskee v. Blue Cross of Nebraska)

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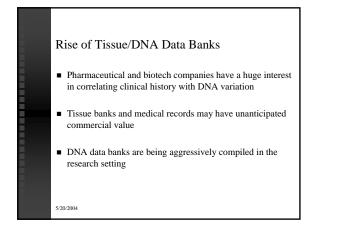








- The ADA forbids using pre-employment medical testing
- The EEOC says that ADA rules protect persons denied employment on the basis of a genetic test
- OSHA exists to promote a safe workplace
- May employers use genetic tests for risk for occupational disease?



Universal DNA Banking

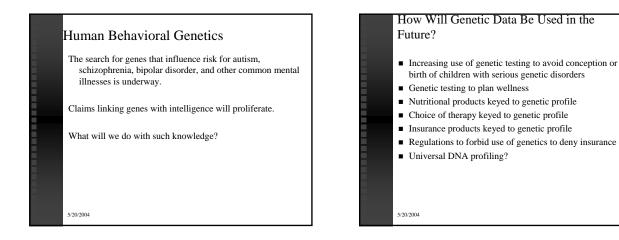
Our society seems to be drifting in the direction of acquiring DNA data on everyone. We have been collecting blood on all newborns since the 1960s. Over the last few years some states have begun to save the samples.

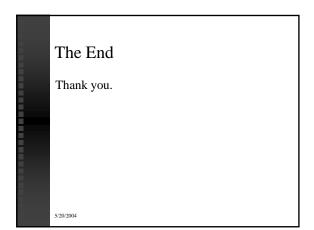
The US military maintains a huge DNA data bank

Every state has a DNA forensic data bank

A few years ago, a consulting group estimated that there are 320 million human tissue samples banked in the USA, more than 1 per person.

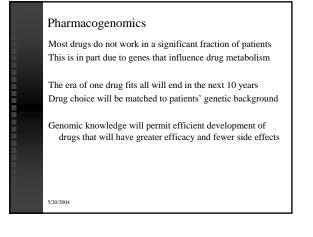
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Biggest Recent Event in Genomics in 2002? Complete sequence of the Malaria parasite (P.falciparum)

- Complete sequence of Anopheles gambiae, its mosquito vector
- In 2002 more than 100 million people developed malaria, and 3 million died of the disease.
- A new therapeutic approach has already emerged from this work.



Nutritional Genomics Goal: Guide consumers to the most effective nutritional supplement based on their genotypes

Example: Some people have a "pro-inflammatory" genotype. The use of an anti-inflammatory nutritional supplement to dampen the inflammatory response may help reduce the risk of or delay the age of onset of chronic inflammatory disorders such as coronary artery disease and osteoarthritis

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Ethical Issues in Gene Therapy

Gene therapy delivers a "normal" gene to a key cell line in an effort to correct a very serious genetic disease.

The only successful use of gene therapy involves the transfer of a gene to treat a rare, rapidly fatal immune disorder (in children for whom no bone marrow donor is available). In France this therapy has apparently cured 10 young children. In one, however, the new gene has caused a fatal form of T-cell leukemia (by interrupting a gene called LMO2 which governs blood cell development).

Should the government permit this research? Should parents be allowed to consent to have children undergo therapy?

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Xenotransplantation

- 79,000 Americans are waiting for organ donation; 16,000 will die while waiting.
- Pigs are being genetically altered so that their organs express cell surface proteins that are human and can therefore trick our immune systems. A line of pigs already exists with kidneys that would not trigger a hyperacute rejection.
- Assuming xenotransplantation is clinically safe, what ethical limits (if any) are there on genetically engineering mammals to serve us in fighting disease?
- 5/20/2004