



## Workplace Genetic Testing and Screening

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## The Promise

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“The majority of potters do not die of bronchitis. It is quite possible that if we really understood the causation of this disease we should find out that only a fraction of potters are of a constitution which renders them liable to it. If so, we could eliminate potter’s bronchitis by regulating entrants into the potters’ industry who are congenitally exposed to it.”

J. B. S. Haldane, 1938



## Gene-environment interactions

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- Primaquine and hemolysis in American soldiers in Korea
- G6PD and “favism”
- Why not workplace exposures?



## Early candidates for “hypersusceptibility”

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- G6PD
- Sickle cell trait
- Alpha-1-antitrypsin deficiency
- Reactions to carbon disulfide
- Reactions to organic isocyanates

Stokinger and Scheel, “Hypersusceptibility and Genetic Problems in Occupational Medicine—A Consensus Report,” *J Occupational Medicine* 15:7 (July 1973) 564-573.



## Early Warning

“Genetic screening is going on already and it will continue to be done, whether or not the experts believe it is scientifically valid...It is time to begin considering questions that we may well face squarely before the end of this decade.”

Author to be identified later, 1983.



## 4 Purposes for Genetic Screening or Testing

- Diagnosis
- Research on workplace illnesses
- Informing workers of their risks
- Excluding workers involuntarily



## Toward an Ethical Analysis

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- How many people have the anomaly?
- What are their relative and absolute risks?
- How many people will be misidentified as false negatives, false positives?
- How many jobs are involved?



## Toward an Ethical Analysis (continued)

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- Are the illnesses serious, irreversible if not detected early
- How solid is the evidence linking disease to genes and exposures likely in the workplace?
- Would screening focus on groups with a history of discrimination?
- How cost-effective is genetic screening relative to other strategies to reduce workplace diseases?



## Conclusions

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- Using genetic tests as part of legitimate medical diagnosis for an individual worker is acceptable.
- Research on the relation between genes, workplace exposures, and illness can be useful.
- Informing workers about genetic risks can be justifiable when the science links alleles, exposures, and disease



## A defensible exclusion policy MUST:

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- Have sound scientific linking genes to exposures to disease
- Have very large relative and absolute risks
- Have few, reversible, misclassifications
- Exclude very few people
- Involve very few jobs
- Target severe, irreversible, disease
- *Not* single out beleaguered groups



## Those who fail to learn from history...

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- EEOC vs Burlington Northern Santa Fe Railroad
- First EEOC lawsuit on genetic testing
- 20-30 BNSF employees unknowingly subjected to test for HNPP, Chromosome 17 deletion claimed to be associated with risk of carpal tunnel syndrome



## HNPP and CTS

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- “HNPP is probably underdiagnosed because it typically has episodic and transient clinical manifestations. Stockton et al. (2001) evaluated 50 patients diagnosed with idiopathic CTS and found no instance of the chromosome 17 microdeletion that causes HNPP.”
- OMIM  
[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=OMIM&dopt=Detailed&tpl=dispomimTemplate&list\\_uids=115430](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=OMIM&dopt=Detailed&tpl=dispomimTemplate&list_uids=115430)



## Disposition of EEOC vs BNSF

- BNSF agreed not to:
  - Directly or indirectly require its employees to submit blood for genetic tests
  - Analyze any blood previously obtained
  - Evaluate, analyze or consider any gene test analysis previously performed on any of its employees
  - Retaliate or threaten...any person who opposed the genetic test or participated in the EEOC proceedings.
- EEOC Statement, 18 April 2001



## Complexities

- BNSF did genetic *testing* not genetic *screening*
- Lead outside counsel for BSNF argues that this is an instance of *genetic exceptionalism*
- Employees should have been informed in any case
- Company docs and divided loyalties
- Not based on good science, an absolute requirement for any use of genetics in the workplace\*
- \* T. H. Murray, "Warning: Screening Workers for Genetic Risk," Hastings Center Report, Feb. 1983: 5-8



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