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BOSTON — Pythagoras, best known for a theorem about the square of the hypotenuse, was also the founder of a widespread religion, Pythagoreanism, that included a rule against eating beans. This rule has long puzzled philosophers but we now have a rational explanation, and it happens to impinge on a current controversy.

Some individuals of Mediterranean origin are poisoned by eating fava beans because these individuals have a genetic defect in a particular enzyme that is known as G6PD. This defect makes red blood cells susceptible to destruction by a component of the fava bean. On the other hand, it also makes these cells resistant to the malarial parasite. Accordingly, the prevalence of the defect in populations from the eastern Mediterranean can be explained by Darwinian selection — that is, when the altered gene arose by a rare mutation thousands of years ago in a malarial region, it rapidly became more frequent in subsequent generations because it allowed persons to survive malaria better and hence to have more progeny.

The distribution of G6PD deficiency has now become a matter of broader interest, with the finding that this enzyme protects not only against the fava bean but also against many potentially toxic chemicals. Tests for this enzyme might therefore be used to detect individuals who would be at exceptionally high risk if exposed to these compounds. Accordingly, some major chemical firms have recently begun to carry out such tests. It is not clear how much testing of this kind is being done, nor is it clear whether the present purpose is primarily to guide employment or to evaluate such methods for the future.

In July, the Institute of Medicine of the National Academy of Sciences held a conference that included this subject within the broader topic of gene-environment interactions. The participants generally agreed that screening for enzyme defects is still a matter for research, and not for industrial practice. However, other critics have objected to the screening in principle, claiming that it shifts the blame for toxic reactions from the employer to the worker, deprives people of the right to free access to a job, and relieves the employer of the obligation to keep down the levels of toxic sub-

Pythagoras, Genetics, And Workers' Rights

By Bernard D. Davis

stances. These objections should be scrutinized carefully, lest we foreclose a potentially valuable activity.

First, the essential issue is not one of industrial conflict but is one of preventive medicine — a pragmatic field that deals with both the individual and the environment in any way that can decrease illness. From this perspective,

screening for genetic differences in susceptibility to chemicals is a logical extension of the public-health practice of skin-testing for the presence or absence of acquired immunity to an infectious disease.

Second, it is artificial to question screening in terms of an abstract right of equal access to a job. One could



hardly defend the right of a hemophilic to be employed as a butcher. The problem is becoming more subtle today: We are learning to detect predispositions that are *not so obvious* to the bearer. Moreover, the problem is bound to grow. The growing fusion of genetics with immunology may soon make it possible to identify hereditary individual differences in the likelihood of developing various allergies. With such advances, certain illnesses cease being unpredictable acts of God. As they become increasingly predictable they also become more preventable — by minimizing exposure, and eventually, we hope, by learning how to modify an individual's reactions. Accordingly, we cannot escape the responsibility for incorporating knowledge of individual genetic differences in preventive medicine.

A third claim is that the limits of exposure to any chemical in industry ought to be set low enough so that nobody could be harmed. The moral principle assumed here is politically attractive. However, with our modern knowledge of genetics it cannot be taken literally. It can hardly be economically feasible to set standards on the basis of the responses of a person far outside the normal range of susceptibility.

Recent examples of mismanagement of toxic wastes hardly generate trust in the control of toxic exposure of workers in industry. Nevertheless, our suspicion should not blind us to the possibility that genetic screening could benefit both workers and man-

Beyond the religious ban on fava beans

agement. There are real questions of policy in determining who should be responsible for the screening and how the results should be used, but an answer that would altogether reject the information would surely be unfair to the susceptible worker.

If we are to proceed rationally we must try to reconcile the ideal of unlimited equality with the reality of genetic diversity. We must therefore evaluate with particular care any arguments that may be used to discourage the useful recognition of that diversity.

As the total suppression of genetics in the Soviet Union for 25 years by Trofim Lysenko reminds us, this field is particularly vulnerable to ideological assault.

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