THE NAME, DIAGNOSIS, AND CONTROL OF PKU

The name of the metabolic error in PKU is phenylalanine hydroxylase deficiency. Before deciding the correct course of treatment, it is important to take into account the factors that contribute to the disease. When the diagnosis of PKU is made, it is necessary to determine the genetic and environmental factors that may have contributed to the disease.

John E. Mullen, MD

THE clinical picture of PKU includes the symptoms of hyperphenylalaninemia, which may manifest as neurocognitive impairment, behavioral problems, and seizures. Early diagnosis and intervention are crucial to prevent the onset of complications. The diagnosis of PKU is made by measuring the phenylalanine levels in the blood and identifying the genetic mutation.

Daniel B. Pearl

13. HOW PKU BECAME A GENETIC DISEASE

The discovery of the gene for phenylalanine hydroxylase led to a breakthrough in understanding the genetic basis of PKU. The gene was mapped to chromosome 12, and the associated protein was identified as a flavin-dependent enzyme.

Human Hormones in the 20th Century

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Three factors are key to producing high-quality children: children's reading, writing, and thinking skills. Children who are proficient in these areas are more likely to succeed in school and in life. However, many children in low-income families do not have access to the resources they need to develop these skills.

1. Reading: Children who read regularly are more likely to succeed in school and in life. However, many children in low-income families do not have access to the resources they need to develop these skills.

2. Writing: Writing is a key skill that helps children express their ideas and thoughts. However, many children in low-income families do not have access to the resources they need to develop this skill.

3. Thinking: Children who think critically and creatively are more likely to succeed in school and in life. However, many children in low-income families do not have access to the resources they need to develop these skills.

In order to help children succeed, it is important to provide them with the resources they need to develop these skills. This can be done through a variety of programs, such as after-school programs, tutoring, and reading programs. By providing children with the resources they need to succeed, we can help them reach their full potential and succeed in school and in life.
Contemporaneous developments in medical genetics aroused a similar mix of enthusiasm and concern. Amniocentesis, the first practical method for detecting genetic disorders in pregnancy, was developed in the 1960s but was of little practical utility before abortion was decriminalized. Following passage of the 1967 Abortion Act in the UK and the 1973 US Supreme Court decision in *Roe v. Wade*, amniocentesis for the purpose of detecting Down syndrome increasingly became a routine aspect of clinical practice. But the use of prenatal diagnosis also provoked controversy, especially around the issue of whether policies designed to forestall the birth of affected children signified a new eugenics.

In the 1970s as well, national and state legislation was first enacted to support research on genetic diseases, as well as promote and regulate genetic screening programmes. Responding to pressure from black professionals, celebrities and community activists who argued that the incidence of sickle cell anaemia was much higher than that of diseases that received far more attention, and that the neglect was explained by the race of the sufferers, in 1972 the US Congress passed the National Sickle Cell Anemia Control Act, which provided funding for sickle cell research, educational activities, and screening and counselling programmes. In his signing statement, President Richard Nixon declared sickle cell anaemia to be an "especially pernicious disease because it strikes only blacks and no one else." Four years later Congress enacted the National Sickle Cell Anemia, Cooley's Anemia, Tay-Sachs, and Genetic Diseases Act, which permitted public funds to be used for voluntary genetic screening and counselling programmes.

By the mid-1970s many screening programmes (under a variety of public and non-governmental auspices) had been established for sickle cell disease and carrier status and also, at the community level, for Tay-Sachs disease. As there was no effective treatment for either disease, the primary aim of such screening was necessarily to provide reproductive information. But sickle cell testing was soon engulfed in controversy when widespread confusion between the sickle cell trait and the disease sickle cell anaemia resulted in the stigmatization of carriers and sometimes discriminatory treatment in jobs and education.

**PKU Screening as a Cautionary Tale**

In this context of heightened awareness of potential pitfalls in screening for genetic conditions, the question arose of what could be learned for the development of other screening programmes from the relatively extensive experience of screening for PKU. The Committee on Inborn Errors of Metabolism of the National Academy of Sciences (NAS), chaired by distinguished paediatrician and geneticist Barton Childs, was charged with investigating the history, current standing and effectiveness of screening for PKU, and also with reviewing screening programmes for other genetic conditions such as the haemoglobinopathies (sickle cell disease and trait and Thalassemia) and Tay-Sachs disease.

In its 1975 report the committee concluded that PKU screening was justified, but it criticized the haste with which screening statutes were enacted in the mid-1960s when there existed unanswered questions regarding which infants needed to be treated and for how long and the efficacy of the low-phenylalanine diet. According to the report, mass screening and treatment were implemented on a broad scale before adequate data were available on the indications and necessity for such treatment, and the decision to mandate the test was characterized as 'ethically questionable because of failure to consider enough facts'. Legislators, hoping to save money and responsive to intense pressure from local parent organizations, enacted statutes whose implications they did not fully understand. To avoid a repetition of this experience, there should be greater oversight of genetic screening programmes, and the committee proposed a set of ethical, legal and economic principles to govern their operation.

The history of newborn screening for PKU thus served as a cautionary tale for genetic testing in general. The lesson drawn by the committee and other commentators was that genetic tests should be assessed by more stringent criteria than was applied in the case of PKU, where screening was mandated prematurely, with "thousands of infants ... subjected to an incompletely validated and potentially hazardous intervention." The point was that although we were lucky and narrowly dodged the bullet, we cannot count on being so fortunate and should not make that mistake again. But history could only serve as a warning if the Guthrie-Susi bacterial assay was defined as a genetic test and the uncertainties, complexities and unintended consequences of screening and treatment for the disease emphasized.

However, in other contexts of genetic research and medicine, the PKU story was already taking a different and ultimately more consequential turn, one that would reinforce the geneticization of the disease but also result in a radical simplification of the account of life with the disease. That trend began in the 1970s with the controversy over the genetics of intelligence and intensified in the 1980s with the debates about whether to map and ultimately sequence all human genes.

**PKU and the Critique of Genetic Determinism**

In 1969 Berkeley psychologist Arthur Jensen famously asked: 'How much can we boost IQ and scholastic achievement? His answer, in effect, was 'not much'. According to Jensen, genetic differences accounted for at least half of the black-white gap in IQ test scores, which explained why compensatory education schemes had failed. His essay produced a storm of controversy, with Jensen criticized both for exaggerating the significance of heritability estimates and for inappropriately generalizing from statistics on the heritability of IQ differences within races to conclusions about differences between them. Two years later Harvard psychologist Richard Herrnstein published an analogous argument in respect to social class, which he soon expanded to a book, *IQ in the Meritocracy.*
PKX and the Human Genome Project

The mention of the human genome project has an additional paragraph about the project, where the text describes the importance of understanding the human genome for medical research and drug development. The text also mentions the ongoing efforts to map the human genome and the role of government and private funding in this endeavor. The paragraph highlights the significant contributions of the Human Genome Project to our understanding of human biology and the potential for future medical breakthroughs.

The paragraph also discusses the ethical implications of the project, including privacy concerns and the potential for misuse of genetic information. It notes the importance of regulating these aspects to ensure the ethical use of genetic data.

The text concludes by emphasizing the interdisciplinary nature of the project, involving collaboration between biology, genetics, computer science, and ethical studies. The paragraph ends with a reflection on the potential future of genetics and the importance of continued investment in research and education in this field.
How PKR Became a Guru for Seattle S"
clearance of the content of the text, making the document difficult to read.