4.2 CLINICAL APPLICATION

Phenylketonuria

In Oslo, Norway, in 1934, an observant mother of two mentally retarded children noticed that their soiled diapers had an odd, musty odor. She mentioned this to Ivar Folling, a relative who was a physician and biochemist. Folling was intrigued. Analyzing the children's urine, he found large amounts of the amino acid phenylalanine, which is usually present only in trace amounts because an enzyme catalyzes a chemical reaction that breaks it down. The children lacked this enzyme because they had inherited an inborn error of metabolism called phenylketonuria, or PKU. Because build-up of phenylalanine causes mental retardation, researchers wondered if a diet very low in phenylalanine might prevent the mental retardation. The diet would include the other nineteen types of amino acids essential for normal growth, but would theoretically counter the over-abundance of phenylalanine that the faulty genes caused.

In 1963, theory became reality when researchers devised a dietary treatment for this otherwise devastating illness (fig. 4A). The diet is very restrictive and difficult to follow, but it does prevent mental retardation. However, treated children may still have learning disabilities. We still do not know how long people with PKU should adhere to the diet, but it may be for their entire lives. ■

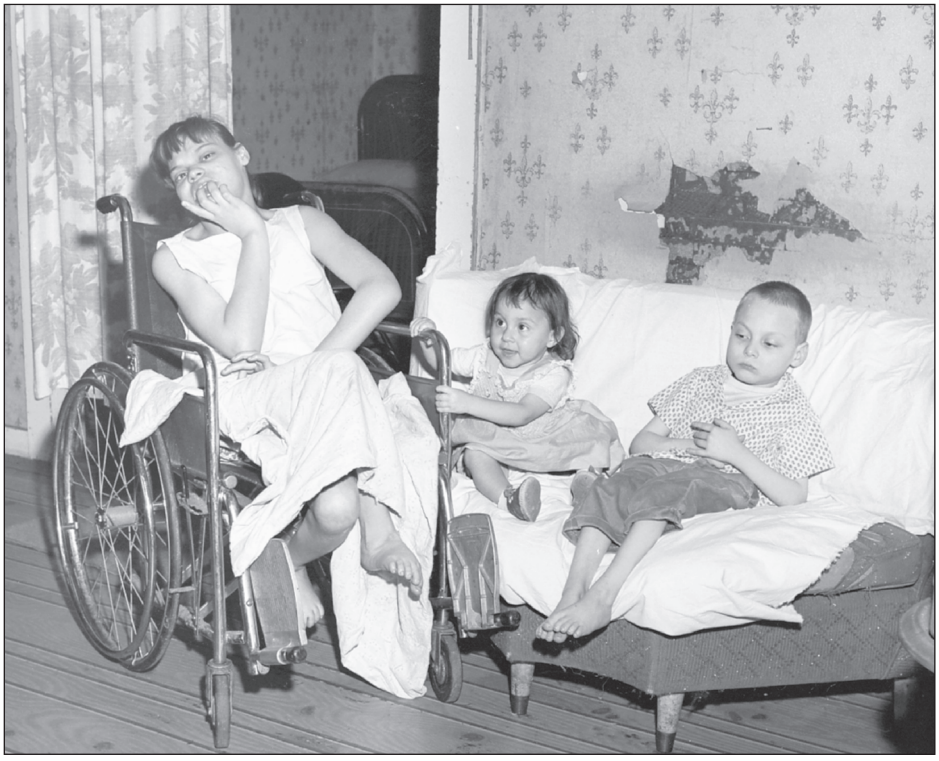

FIGURE 4A

These three siblings have each inherited PKU. The older two siblings—the girl in the wheelchair and the boy on the right—are mentally retarded because they were born before a diet that prevents symptoms became available. The child in the middle, although she also has inherited PKU, is of normal intelligence because she was lucky enough to have been born after the diet was invented.