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A mathematical model for natural resistance against galactosemia

Jayasundara N.D.K.* and Shanthidevi K.C.N.

Department of Mathematics, University of Ruhuna, Wellamadama, Matara, Sri Lanka

Infants with Galactosemia cannot metabolize lactose and galactose, two sugars found in milk. Because in the infant gut, the galactose converted to glucose through a series of enzymatic reactions. In Galactosemia, galactose-1-phosphate uridyl transferase (GALT) is missing or defective. This means too much galactose will build up in blood, resulting in, among other things, liver failure. Galactosemia is a rare genetic disorder relates with the subject, negative eugenics, the use of sterilization to eliminate harmful genetic traits from human society. Often, the reason that lethal recessive traits occur is that normal alleles mutate to defective alleles. There are a number of different alleles that can cause variations of Galactosemia. Mutation rates are difficult to estimate directly. In this paper, we have proposed a dynamical system model and approximated a joint mutation rate for the lethal traits, given the equilibrium genetic makeup of the population. We used the information on the fraction of children born with the genetic trait to determine the equilibrium genetic makeup. By computations, it is clear that mutation rate declines and the risk of Galactosemia decreases. So natural selection can work to decrease the proportion of the harmful genetic traits from human society.

Keywords: Galactosemia, galactose, glucose, mutation, equilibrium

*Corresponding Author: nisansalajayasundara93@gmail.com