GLOSSARY

Developmental origins of adult health and disease

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The aim of this glossary is to define some key terms used in the field of developmental and life course epidemiology.

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ADAPTATION
The changes by which living things surmount the challenges of life.

BRAIN SPARING
A human baby receiving an inadequate supply of nutrients or oxygen may protect its brain. One way in which it does this is by diverting more blood to the brain at the expense of the blood supply to the trunk. The growth of organs such as the liver is therefore ''traded off'' to protect growth of the brain. Brain sparing may also be effected through metabolic processes such as insulin resistance.

CONSTRAINT
Responses to an adverse environment during development may be adaptive, helping a plant or animal to survive, or may simply be the result of constraint.

DARWINISM
This term is often used to describe the natural selection of genes that optimises the fitness of a species in a particular environment. Darwin was also aware, however, that the environment to which individuals are exposed during development produces variation within one generation. ''When a variation is of the slightest use to a being'', he wrote, ''we cannot tell how much of it to attribute to the accumulative action of natural selection, and how much to the conditions of life''.

DEVELOPMENTAL PLASTICITY
Plasticity is a universal quality of living things as they develop. Within the limits imposed by its genes and by mechanical constraints, each individual has a range of options for its life history and final body form and function. The formal definition of developmental plasticity is ''the ability of a single genotype to produce more than one alternative form of structure, physiological state or behaviour in response to environmental conditions''.

DIFFERENTIATION
This describes the changes in the form and function of cells during development, which enables them to carry our specialised tasks.

EMBRYO
In humans the embryonic period spans the first eight weeks of development. It results in a recognisable human being though with a large head and a small body.

FETAL ORIGINS HYPOTHESIS
A term used for the hypothesis that cardiovascular disease and type 2 diabetes originate through developmental plasticity, in response to undernutrition. As it is now known that growth during infancy and early childhood is also linked to later disease ''developmental origins hypothesis'' is now preferred.

FETUS
After the first eight weeks the developing human becomes a fetus. This is the period of fastest growth in a lifetime.

FITNESS
In animals fitness is measured by reproductive success, by the number of offspring that live to breed in their turn.

GENE EXPRESSION
The production of the particular protein that the gene is coded to make.

GENETIC IMPRINTING
The ability of genes derived from one parent to override or ''imprint'' the expression of these derived from the other.

GENOTYPE
The genetic constitution of a living thing.

GROWTH TRAJECTORY
At an early stage a baby establishes a trajectory of growth, a path that will lead it to a target body size at birth. Having established a trajectory it tries to sustain this throughout its life in the womb. After birth, the infant resets the trajectory and growth sets off on a new path and tempo.

INTERGENERATIONAL EFFECTS
Experiments in animals have demonstrated that changes in the diet during pregnancy may affect the offspring for several generations. Evidence for the existence of such intergenerational effects in humans comes from the strong association between a mother's own birth weight and the birth weight of her babies. Evidence of intergenerational effects on adult disease is beginning to emerge.

LIFE HISTORY THEORY
This states that, if the total amount of energy available to an animal is limited, as it usually is,

increased allocation of energy to one trait, such as growth, must reduce allocation to one or more other traits, such as repair of the body. There are therefore ''trade offs'' during development. [See ''brain sparing'']

PARENT-CHILD CONFLICT

The theory of ''parent-child'' conflict proposes that natural selection encourages babies to demand more resources from parents than parents are selected to give. During evolution a baby's genes will have been selected to increase the transfer of food to it, from the mother, so that it can grow larger. A mother's genes will have been selected to limit transfer of food to the baby in order to ensure the survival of the mother and of her other children, born and unborn.

PHENOTYPE

All aspects of a living thing other than its genetic constitution.

PROGRAMMING

This term has been used to describe the process whereby a stimulus or insult at a ''sensitive'' or ''critical'' period of development, has lasting effects on the structure or function of the body. The term ''programming'', however, has different meanings in ethology and other areas of biology, and is no longer recommended to describe the developmental origins of adult disease.

SENSITIVE PERIOD

The ''sensitive'' or ''critical'' period in the development of a tissue or system is the time during development when it can be permanently changed by influences such as undernutrition, hypoxia, or stress. The sensitive period often coincides with a period of rapid cell division and for most tissues and systems it occurs before birth. The brain and liver are the main two organs that remain plastic after birth.

THRIFTY PHENOTYPE

A term that was coined to describe the hypothesis that insulin resistance and type 2 diabetes originate through undernutrition in the womb. The hypothesis proposes that an undernourished baby becomes thrifty. It maintains high levels of sugar in the bloodstream that benefit the brain, but less sugar is stored in muscles. Muscle growth may be ''traded off'' to protect the brain. Once adopted, this thrifty behaviour becomes permanent and, combined with adiposity in later life, leads to type 2 diabetes. [See ''brain sparing'']

TRADE OFFS

See ''life history theory''.

TURNOVER

A proportion of the protein and fat in the body is broken down and re-formed each day. This may be an important source of food for the fetus. While only about 1% of a mother's fat stores is turned over every day, the size of the stores is such that the fatty acid composition of a mother's diet during pregnancy may only be of secondary importance to the fetus.