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Screen test

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A low-cost, enzyme-based screening kit could help prevent infants in poor countries from developing disorders that lead to mental disabilities, claim its developers.

Research by Enzolve Technologies based at NovaUCD, the technology transfer centre at University College Dublin, has led to the NeoScreenPak kit. It can detect common disorders that all newborn children are routinely tested for in most of western Europe.

These conditions, which include phenylketonuria (PKU), maple syrup urine disease, homocystinuria, galactosaemia and congenital hypothyroidism, can cause long-term and serious impairment if left undetected and untreated.

'It is an enzyme-based method for measuring elevated levels of metabolic compounds in the blood of newborn babies,' said Prof Paul Engel, director of Enzolve.

'While that is not unique in itself, the novel aspect is that the enzymes we are using are genetically engineered, so we have a wider range of enzymes for measuring different metabolites than are generally available.

'For example, one of our enzymes is able to measure elevated levels of methionine in the blood, a methionine dehydrogenase. It is an enzyme that does not exist in nature.'

The first of Enzolve's tests to be commercialised is for PKU, which is indicated by excess levels of amino acids called phenylalanine that the child's nervous system cannot cope with. Early detection means the child's diet can be supplemented to lower protein levels until the age of nine, when the nervous system will have sufficiently developed to be able to deal with the excess amino acid unaided.

In most advanced health systems, when a baby is born medical staff take a heel prick and collect a few drops of blood on filter paper discs for analysis.

In Enzolve's system a small hole punch is used to remove a section of the dried blood sample. The soluble contents are soaked out and put through the enzyme reaction process.

Existing enzyme-based measuring techniques consist of two steps, using chemicals in the second. Enzolve's technology, however, uses enzymes for both stages, so that the whole analysis can be conducted 'in the same pot', making it simpler and faster to carry out.

'The first enzyme catalyses the reaction between the substance you want to detect [phenylalanine in the case of PKU], and a coenzyme called NAD (nicotinamide adenine dinucleotide). The two react with one another and the product of this first reaction is NADH,' said Engel.

'The second reaction, which also uses an enzyme, is a way of turning that increase in NADH concentration into a strong colour, which can be readily measured using simple spectrophotometry.'

One of these tests can be carried out in 10 minutes, which Engel claimed is faster than existing blood-screening methods such as the Guthrie microbiological growth test, which takes 24 to 48 hours and gives a qualitative rather than quantitative answer.

Engel said each NeoScreenPak kit has the capacity to test 1,000 newborn babies at a cost of about €0.40 (30p) a test, compared with existing tests that cost about €1 each.

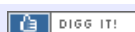
According to Engel, one of the reasons it is cheaper compared with other enzyme tests on the market is that the Dublin scientists have engineered an enzyme that is able to operate more efficiently in low concentrations of the substance to be detected, such as the phenylalanine in PKU. 'That means we need to add a lot less enzyme than others,' he said.

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