

Rate of aging may be determined in the womb and linked to birthweight, study reveals

July 8 2013

Scientists have found that key metabolites in blood – chemical 'fingerprints' left behind as a result of early molecular changes before birth or in infancy – could provide clues to a person's long-term overall health and rate of ageing in later life.

Published today in the *International Journal of Epidemiology*, the international study of twins led by King's College London highlights how a technique called metabolomic profiling has revealed a collection of 22 [metabolites](#) linked to ageing. One of these, linked to ageing traits such as [lung function](#) and bone mineral density, is also strongly associated with birthweight – a well-known developmental determinant of healthy ageing.

This finding suggests that levels of this novel metabolite, which may be determined in the womb and affected by nutrition during development, could reflect accelerated ageing in later adult life. Scientists say the findings show it is possible that these markers of ageing can be identified with simple blood tests in the future, which may provide further clues to the ageing process and could pave the way for development of therapies to treat age-related conditions.

Professor Tim Spector, Head of the Department of Twin Research at King's College London, said: 'Scientists have known for a long time that a person's weight at the time of birth is an important determinant of

health in middle and old age, and that people with [low birth weight](#) are more susceptible to age related diseases. So far the [molecular mechanisms](#) that link [low birthweight](#) to health or disease in old age had remained elusive, but this discovery has revealed one of the molecular pathways involved.'

Funded by the European Commission, Researchers from the Department of Twin Research at King's carried out metabolomic profiling – the study of metabolites that specific [cellular processes](#) or changes leave behind in the blood. Analysing blood samples donated by over 6,000 twins, they identified 22 metabolites directly linked to chronological age – the concentrations of the metabolites were higher in older people than in younger people.

One particular metabolite – C-glyTrp – is associated with a range of age-related traits such as lung function, [bone mineral density](#), cholesterol and blood pressure. Its role in ageing is completely novel. Crucially, researchers found it was also associated with lower weight at birth when they compared the birth weights of identical twins.

To explore the link between birth weight and the metabolite, the researchers showed via genetic tests that the gene influencing the levels could be modified epigenetically (whereby genes are switched on or off by chemical switches triggered by the person's environment or lifestyle). These epigenetic changes may then influence metabolism during a person's lifetime, which in turn influences their risk of age-related diseases.

Ana Valdes, lead researcher from King's, said: 'Human ageing is a process influenced by genetic, lifestyle and environmental factors, but genes only explain a part of the story. Molecular changes that influence how we age over time are triggered by epigenetic changes. This study has for the first time used analysis of blood and epigenetic changes to

identify a novel metabolite that has a link to birthweight and rate of ageing.

'This unique metabolite, which is related to age and age related diseases, was different in genetically identical twins that had very different weight at birth. This shows us that birth weight affects a molecular mechanism that alters this metabolite. This may help us understand how lower nutrition in the womb alters molecular pathways that result in faster ageing and a higher risk of age-related diseases fifty years later.

'Understanding the [molecular pathways](#) involved in the [ageing process](#) could ultimately pave the way for future therapies to treat age-related conditions. As these 22 metabolites linked to ageing are detectable in the blood, we can now predict actual age from a blood sample pretty accurately and in the future this can be refined to potentially identify future rapid biological ageing in individuals.'

More information: Published in the *International Journal of Epidemiology* 2013;1-9. doi:10/1093/ije/dyt094

Provided by King's College London

Citation: Rate of aging may be determined in the womb and linked to birthweight, study reveals (2013, July 8) retrieved 17 April 2024 from <https://medicalxpress.com/news/2013-07-aging-womb-linked-birthweight-reveals.html>

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