

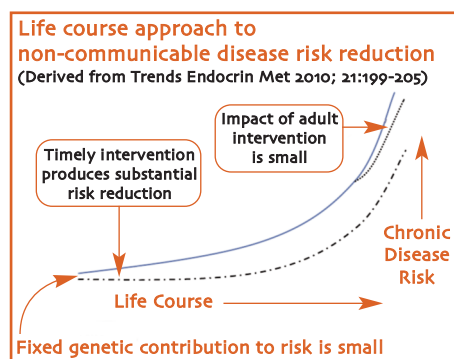
Science for health literacy: it's never been so important

■ The *Lifelab* Team

Lifelab is a science-based approach to changing teenagers' health-related attitudes and behaviour.

Two very recent reports have emphasised the critical importance of tackling health issues in Britain. The Chief Medical Officer for England, Professor Dame Sally Davies, has issued a stark warning that the ever-growing resistance to antibiotics now poses as big a threat as terrorism. She believes that routine operations could become deadly in just twenty years if we lose the ability to fight infection, and this is due to over-prescribing antibiotics, lack of hygiene measures to prevent infections, and lack of investment in the development of new antibiotics (Davies, 2013). Meanwhile, a major new study reported in *The Lancet* (Murray *et al*, 2013) shows that the UK is lagging behind other comparable countries in Europe and elsewhere in confronting the consequences of non-communicable diseases (NCDs) such as heart disease, stroke, cancer, lung and liver disease. The main risk factors causing our nation's poor health are smoking, high blood pressure, obesity, lack of exercise, poor diet and alcohol. The strong message emerging from this research is that 'The performance of the UK in terms of premature mortality is persistently and significantly below the mean of [comparable countries] and requires additional concerted action' (p.1).

Figure 1



One potentially effective way of dealing with our nation's poor health is by educating people to become more health literate, i.e. helping people to cultivate the knowledge and skills needed to access, understand and use health information, thus enabling and encouraging them to make healthier lifestyle choices. This article outlines a project called *Lifelab*, developed by researchers at the Education School, Faculty of Medicine and the NIHR Biomedical Research Centre at the University of Southampton, to promote a science-oriented approach to health literacy among teenagers.

The main purposes of *Lifelab* are:

- to improve youngsters' knowledge, attitudes and behaviour in relation to their health and the health of their future children; and
- to encourage them to consider taking science post-16 and making science-related career choices.

The centrepiece is a one-day, hands-on visit to a university/hospital-based laboratory, where pupils learn about the science underpinning health issues using equipment not normally available in schools. This includes activities such as gel electrophoresis, DNA extraction, measuring body mass index, using ultrasound to measure flow through carotid arteries, investigating the transport of nutrients across a real human placenta, and small, informal group discussions with scientists to find out about their work.

Importantly, this visit is not an isolated event, but is undertaken in conjunction with stimulating school-based lessons built into science schemes of work, by using health issues as a context for understanding key science concepts and developing associated skills. These lessons include decision-making discussions about health issues, small group science investigations and the production of scientific posters, which are presented to parents and other local

dignitaries at a twilight celebration event held at the University.

A further vital component of *Lifelab* is a CPD session for the science teachers, to update them on contemporary science behind the issues and give them added confidence to lead the school-based lessons and actively join in the University laboratory-based visits.

Why teenagers? And why science?

Research at Southampton and elsewhere has shown that developing a healthy lifestyle at an early age can have profound consequences on our long-term health, and on the health of our future children. Figure 1 shows how adopting a healthy lifestyle in early life can have a much bigger impact than an intervention during adulthood, changing our life course and putting us on a 'healthier' trajectory by reducing our risk of chronic disease. Indeed, in the field of developmental origins of health and disease (DOHaD), it is now well established that even the environment we experience in the womb is critical for setting lifelong health trajectories, and can have a profound effect on our vulnerability to NCD risk. So early life interventions may be more effective than traditional treatments in later life – a message that we need to get across to teenagers before they have children of their own.

Pupils (and teachers) are generally aware that the risk of getting NCDs can be attributed to a combination of our genetics and our environment, but research now indicates that the inherited contribution is overemphasised. In a recent poll of postgraduate trainee science teachers at Southampton, almost half thought that the contribution of our fixed genetic make-up to the risk of some diseases such as adult diabetes and coronary heart disease was between 25-50%; there is now increasing evidence that it is actually less than 10%. This is because our genetic make-up is not as

'fixed' as was once thought, but due to the process of epigenetics through which our environment, particularly in early life (i.e. before and after birth), can change the structure of our DNA, switching genes on and off and thus altering the way our genes express themselves. Despite the importance of epigenetics, it does not appear in the current (or the new draft) science curriculum, and half of the Southampton science trainee teachers had never even heard of it, so it is not surprising that pupils do not have an inkling of what it is about. The *LifeLab* programme includes discussion with pupils about how the science behind infectious diseases, NCDs, epigenetics, DOHaD, and antibiotic resistance underpin the need to adopt healthy lifestyles.

In an ideal world, we should of course be building children's health literacy from a very early age through the progressive, spiral curriculum and, in time, *LifeLab* intends to work with primary and post-16 students, but as a starting point our optimal approach is to target Year 8 and 9 (age 13 and 14) pupils. Depending on the schools, these year groups tend to have more flexibility within the curriculum, and the pupils are at an age where they are still sufficiently impressionable to seriously consider adopting a healthier lifestyle, and still (hopefully) not sexually active, yet old enough to understand some of the important underpinning scientific concepts. Furthermore, as 'health education' does not exist as a curriculum subject, and PSHE is non-statutory and taught unevenly across schools, embedding health in the compulsory science curriculum is our one hope for developing universally health literate youngsters.

The impact of *LifeLab*

Over 1000 pupils have now taken part in *LifeLab*, and over 60 science teachers have undergone CPD training to support their pupils during the *LifeLab* activities. A comparison between questionnaires and interviews just before the *LifeLab* experience, and six months after, has revealed statistically significant changes (Grace *et al.*, 2012). Pupils across the range of abilities have a better understanding of the nature and causes of diseases, and are better equipped to reason about health issues. They have a greater appreciation that their current lifestyle can affect their long-term health and that of their future

children, and they are genuinely motivated by the experience:

'I went back and told Mum and Dad everything, 'cause it was all interesting.'

'[I liked] extracting my DNA...because it was like, working with all the scientific equipment, and we were learning how to see our DNA and everything, it was different to what I'm used to.'

'...[LifeLab helped] me see where I am as a weight comparison, see if I'm underweight, overweight and whatever, and I did that scan and I learnt how to ultrasound scan someone.'

Some even report behavioural changes:

'I'm eating more healthy than I used to – cutting down on my fatty foods.'

Pupils have also become significantly more interested in studying post-compulsory science and in considering science and healthcare career options:

'I'm interested in forensics...made me more excited and interested in looking into it.'

'It made me more aware of science, [so you can] look deeper into it when you are doing science, especially as some of us are doing triple science.'

Teachers have reported the additional skills developed by their pupils in using equipment not readily available in schools. For many students it is the first time they have visited a hospital, and this experience can allay fears about hospitals by showing them to be vibrant places where active scientific research takes place.

Teachers involved in *LifeLab* have also reported increased interest and motivation among their pupils:

'You could see how worthwhile it was. It brought people like [student x], who I have struggled with this year trying to get him on side, and he got so into it that day, it made me realise how much cleverer he is than I unfortunately thought he was. He was far brighter, and he's actually been so much better since - way better - like today he's worked really well and got all the work done.'

One school was praised in its Ofsted report for taking part in *LifeLab*:

'A particularly successful workshop, "LifeLab Southampton", is based at the local hospital and is making an important contribution to students' understanding of the need to adopt healthy lifestyles.'

LifeLab builds on an approach used by *LENScience*, University of Auckland. The two initiatives are currently carrying out comparative research funded by the Bupa



Foundation to evaluate the long-term impact. Britain is certainly not alone in the struggle to combat these preventable health issues, but it has fallen behind its counterparts in recent decades, and the *LifeLab* science for health literacy approach appears to be a promising way forward.

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