Professor Gerald Berenson is interested in the biological mechanisms of cardiovascular disease. He discusses his involvement in the Bogalusa Heart Study – a detailed investigation of a biracial population of children.

Can you explain how you came to be involved in research on the prevention of heart disease?

My initial interest in cardiovascular research came from wanting to study rheumatic fever in children. The shift to adults came after serving in the US Navy when, by chance, I was offered a position in internal medicine to carry out research in adults. A clerkship in pathology during my final year of medical school offered me an insight into autopsy and the pathology of disease. Pursuing a career in internal medicine and cardiology certainly contributed.

Autopsy findings in young children show atherosclerosis in the coronary vessels and aorta. This led me to appreciate the importance of family history for offspring with disease. I knew there was evidence that lesions and disease in young people could be brought about through an individual’s culture or environment; for example, Mediterranean countries like Greece and Crete have little heart disease, whereas Eastern European countries have high prevalence rates. These observations led to an understanding that controlling risk factors can lead to reduced heart disease and emphasised the need for primordial prevention.

The Bogalusa Heart Study has been ongoing for over 42 years. How did it come about?

I decided to look at risk factors in children and so submitted an initial application to the National Institutes of Health to study children born at our large community hospital, which, at first, was rejected. Dr Bill Connor – a nutrition expert who developed the Muscatine Study at the University of Iowa – suggested selecting a specific community on which to focus, so I picked Bogalusa, where I grew up. My folks were outstanding community members so that – along with the fact that my team had been gradually hiring staff, coordinators and nurses from Bogalusa – helped us get accepted.

At the outset, we did not know the classic risk factors in children, so our first task was to perform a population study. I recruited 4,500 schoolchildren and collected extensive risk factor data. We then specifically investigated blood pressure, and put children with both normal and high blood pressure through a clinical trial. The biracial (black/white) contrasts provided many clues to mechanisms of disease.

You’ve mentioned in the past how fortunate you were to select the Bogalusa community. Can you provide specific reasons for this?

Bogalusa is like any community in the south eastern states in the US and consists of black and white people. This soon became significant because the contrasts we found between these two groups were dramatic: blood pressure tends to be higher in black people, even in childhood; the relationship of body fat to an increase in blood pressure is greater in white males; and potassium excretion in black people is 30 per cent less efficient than in white people. These differences brought up questions that you cannot answer in a population study.

We were lucky to select a black-white population because we know that black males are more likely to die by the age of 75, while white males may live to 80, so there’s a contrast not only in gender but also in race and genetics that is becoming apparent.

What are the core aims of your programme of research?

Our main aim is to understand the different mechanisms that produce more accelerated ageing in certain individuals. Why do some people die at 75 and others live to 100? Ageing is a fascinating problem and it’s complex. We have to consider renal disease, cerebral disease, cardiac disease, renal changes etc.

The most interesting aspect of our work is to start a prevention programme in pre-school and school-aged children. Lifestyles are learned at home and then modified when the child arrives at school. The core message of the Bogalusa Heart Study is that prevention needs to be introduced at a young age because coronary heart disease, hypertension, diabetes and obesity all begin in childhood.

Finally, what have been the highlights of your career?

My highlights have included the privilege of being involved in the education of 3,000-5,000 medical students and young cardiologists; and participating in cardiovascular and population research, particularly that including children from kindergarten to 6th grade, studying diet, exercise and social behaviour. Our earlier biochemistry research on arterial wall proteoglycans set the stage for exploring risk factors in children and a background for research on ageing.
Almost one in four deaths in the US each year is attributed to heart disease, making it the leading cause of death for both men and women. Most are familiar with the traditional ways we can prevent the onset of cardiovascular disease: by eating healthily, maintaining an appropriate weight, exercising regularly, not smoking and maintaining a positive outlook.

In 1972, residents of a small community in Bogalusa, Louisiana, USA, were invited to become part of the most detailed study of black and white children in the world. As the only investigation of a well-defined, biracial and semi-rural community, which is comparable to many other communities in the south eastern US, the Bogalusa Heart Study has provided many fascinating insights, as well as improved our understanding of the predictors of coronary heart disease, high blood pressure and type 2 diabetes.

It has been led by Professor Gerald Berenson from Louisiana State University and Tulane University for over four decades, and began by focusing on three defined age groups: 5- to 17-year-old school children, 2.5- to 5.5-year-old preschool children and newborn infants. The average age of all the participants is now 45 years, and the process of continuous monitoring has enabled the team of researchers to make many observations regarding the pathogenesis of adult disease. Understanding the biological mechanisms that lead to the diseased state enables scientists to recommend preventive measures to ensure heart disease is no longer the primary cause of mortality in the US.

**Primordial Prevention**

One of the key findings of the study has been that ageing begins in childhood. This knowledge – coupled with an understanding of important risk factors and evidence of developing cardiovascular disease from atherosclerosis, high blood pressure, obesity and diabetes – has led to an emphasis on the need for primordial prevention. Despite the fact that the majority of problems concerning cardiovascular disease do not manifest themselves until we enter our 40s, the underlying mechanisms are put in process when we are children.

Primordial prevention can take many forms. Addressing an individual’s diet and exercise regime, as well as educating them on the importance of leading a healthy lifestyle, is a simple, yet highly effective means of ensuring children can remain healthy long into their
Understanding the biological mechanisms that lead to the diseased state enables scientists to recommend preventive measures to ensure heart disease is no longer the primary cause of death in the US.

AUTOPSY FINDINGS
One of the most fascinating discoveries has come through performing autopsies, where it has been shown that atherosclerosis in the coronary vessels and aorta occur at a very young age. The large pool of study subjects has enabled the team to perform autopsies at a young age to better understand the onset of cardiovascular disease. The researchers plan to continue this particular aspect of their research by looking at the deaths of 600 individuals over the 40 years of the study, where 90 are a result of cardiovascular disease and 40 are from coronary artery disease and myocardial infarction, at an average age of 44 years.