

Could the future be 'survival of the shortest'?

NEARLY 1,000 genetic diseases affect the size we are – diseases known as dysplasias, dystosias and dwarfisms. Collectively they affect hundreds of thousands of people and often cause much suffering. Little can be done about most of them beyond brutally interventionist orthopaedic surgery. Yet to the scientist, these diseases are fascinating. This is because each one is caused by a mutation in at least one of the 30,000 genes which make up the human genome. Each one tells us something about the marvellously complex molecular systems that determine the size we are.

What they tell us can be quite unexpected. Recently, it has become clear that there is a link between growth and longevity. Some of the molecular systems that control size in mammals also control how long they live, perhaps even how fast they age. As any dog-fancier knows, giant breeds such as St Bernards, Newfoundlands, Great Danes do not live nearly as long as toy breeds,

chihuahuas, toy poodles and the like. A student of mine, Ingrid Bates, recently assembled data on longevity and body size for 400 breeds of dogs. Amazingly, she found that body size explains nearly 50 per cent of the variation in longevity. If you want a friend for a long time, choose a chihuahua.

Why do small dogs live longer than big ones? Mutant dwarf mice do not age as quickly as normal-sized mice; perhaps this is true for small dogs as well. But being big may have other risks as well.

Bella, a Newfoundland which belonged to some friends, contracted osteosarcoma, or bone cancer, at three months, underwent chemotherapy, but had a relapse and died just a few years later. This is not unusual. Giant breeds have a risk of getting osteosarcoma that is 180 times greater than toy breeds, and they tend to get it while they are growing. Similarly, osteosarcoma in humans is a disease that children tend to get during the pubertal growth spurt. It is a terrible, but

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thankfully rare disease, afflicting only three in a million children. But of those three, a disproportionate number seem to be the tallest in their age-groups.

Are there other health costs to being tall? Might short people be genetically programmed to live longer? The idea is not implausible: the growth of mice, dogs and humans are all controlled by the same molecular systems. What works for mice should work for us. Yet the notion that small is good violates all our everyday experience about the relationship between height and longevity. There is a good reason for this and, as so often in Britain, the reason comes down to class.

When *The Frost Report* satirised the class system, it was elongate John Cleese who played the city gentleman and tiny Ronnie Corbett who played the working-class cheeky chappy. Even in 1985, men from the top two social classes were nearly 2cm taller than those from the bottom two social classes; in Whitehall, top mandarins are nearly five centimetres taller than men in the lowest grade. The top classes are also, as any number of trenchant reports have made clear, much healthier than the lower ones and have

lower mortality rates. Wealth confers height, health and longevity; it has always been thus in Britain. I suspect that these socioeconomic imperatives obscure the genetic costs to being big that we see in laboratory animals.

The long historical association between height, wealth and health has given us a culture that favours the tall. Tall is good, big is beautiful. I wonder if this will always be so. Perhaps, in the future, when socioeconomic differences in height have disappeared we will find our notions of the relationship between height and health overturned. But let me be clear. If you are short I do not want you to leave this lecture awash in self-congratulation; if you are tall, I do not want you to leave with a sense of doom. But I would have you question what you think you know about the immense amount of variation that the human body presents us with. And at the very least we should tell our children that being short is no impediment to just about anything one might wish to do in life.