

great potential. But in drawing its conclusions, the study group made the generous assumption that the system would work perfectly—optimistic given the recent history of test failures in ABM test programmes. The systems necessary to link arrays of space-based sensors and land-, sea-, air- and space-based weapons with sufficient accuracy during the short boost phase are complicated and unproven. A further worry for the boost-phase system is that military commanders have at most 30 seconds to debate whether to shoot down a missile that might actually be a peaceful satellite launcher. Given the scientific reservations about a project that has cost so much already, it is not surprising that the General Accounting Office

(Congress's non-partisan investigative agency) has criticised the MDA for not using enough "knowledge-based practices".

Some of America's friends and allies, however, may be hoping such incompetence continues. This is because of a final interesting twist in the tale. In the unlikely event that either ABMs or lasers could be made to hit a missile during its boost phase, they would not destroy the hardened warhead. A successful intercept of a missile launched from either North Korea or Iran thus runs the risk of dropping the missile's warhead, and its cargo of nuclear, biological or chemical weapons, on to Canada, Russia, or western Europe. One man's meat might turn out to be another man's poison. ■

wanted to see what effect stress in a person's early 20s had, and considered stressful events related to such things as relationships, employment and health.

Of those subjects who were seriously stressed in their early 20s (having four or more stressful episodes, after a stress-free youth), 33% who had a copy of the short version became depressed. By contrast, only 17% of those with two long versions succumbed to the black dog. Almost a quarter of reported cases of depression could be accounted for by the 10% of subjects that had both short versions of the promoter and stressful experiences.

Severe stress alone will not cause depression; the sufferer must have the short promoter variant. And the two-thirds of the population that have this must suffer severe stress before they are likely to become depressed. Having one without the other is no different from having neither.

There is only one fly in the researcher's ointment. Short versions work by creating less of a protein that sucks serotonin away from the junctions between nerve cells. This suggests that people with short versions of the promoter have serotonin that hangs around for longer. But if scientists are also right about the way that Prozac-like antidepressants work, then it would be expected that people with short versions would be less susceptible to depression, not more. Add to this conundrum the fact that antidepressant drugs take weeks to have an effect, even though measurable serotonin levels rise soon after they are taken. It seems likely that the mechanism is far more complicated than was previously thought.

More research, as scientists delight to say, is needed. But the broad message is clear enough. The more science learns about the genome, the more vulnerable to experience genes appear to be. ■

## Depression

# The long and the short of it

### Depression can be caused by a particular gene and a stressful environment

THE often contentious debate about whether it is one's genes or one's environment that is the more potent shaper of one's human essence was, until recently, unclouded by many facts. But last year, a rather striking fact was provided by Terrie Moffitt and Avshalom Caspi, of the Institute of Psychiatry at King's College London, and their colleagues.

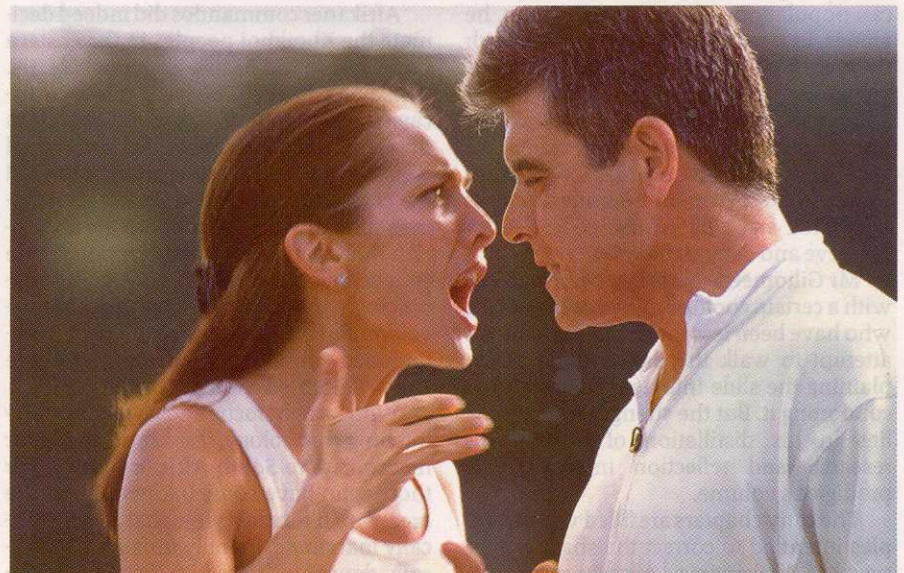
The two researchers found that violence in adults could result from the interaction between an abusive childhood and two different versions of a DNA switch that controls a gene called monoamine oxidase. Both childhood abuse and a particular version of the switch are needed to give a high chance of a person's becoming violent. In other words, then, it is nature with nurture that is the key, and not nature versus nurture.

Now Dr Moffitt and Dr Caspi are back, in a paper in this week's *Science*, with a similar conclusion for those who are trying to understand the causes of depression. The story starts with a gene called 5-HTT that controls the uptake of a chemical called serotonin into nerve cells. Serotonin carries signals between nerve cells and helps to regulate a person's mood. Persistently low levels of it are thought to cause depression. Several antidepressants, including Prozac, are thought to work by blocking the uptake of serotonin into nerve cells. If it hangs around longer, it produces a stronger signal.

However, people can inherit different versions of a region of DNA—known as a promoter region—that is responsible for switching 5-HTT on and off. Dr Moffitt

looked at the versions in 800 young men and women involved in a New Zealand project called the Dunedin Multidisciplinary Health and Development Study. The subjects have been studied from birth, and are now in their late 20s.

5-HTT-promoters come in two flavours, known as "short" and "long". Since people inherit one version of this promoter from their mother and one from their father, they can have two shorts, two longs, or one of each. The researchers divided their subjects into each of the three groups, and also according to those subjects' experience of stress and depression. They



Health warning: can lead to depression