Never say die

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Yes, you can have eternal youth, but you will probably have to give up the cake, writes Deborah Smith.

Worms that crawl around in the soil are usually associated with death, not life. But mutant earthworms created late last year could hold the key to how to delay decay and live for a very long time.

By tinkering with genes, American researchers were able to extend the life span of the worms to six times the normal length, a record for any creature. "In human terms, these animals would correspond to healthy, active 500-year-olds," the University of California team who made them estimated.

Worms and people share a surprising amount of body chemistry in common. And these slimy Methuselahs are a good example of the promise of longevity research, and its early stage of development.

Despite a flourishing anti-ageing industry, major scientific successes

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have so far been restricted to worms, fruit flies and rats. Only three ways of extending life span in animals have worked so far - breeding programs, semi-starvation and genetic modification, none of them great options for humans.

This vacuum between desire for a fountain of youth and the reality makes for lively debate.

Dr Michael Fossel, one of the leading experts on ageing attending the inaugural International Conference on Longevity in Sydney this weekend, believes that within a decade ways to "reverse" ageing, by resetting genes to the way they operated when a cell was young, will become available.

We may even be able to live for a "couple of centuries" longer, until we're 300, predicts Fossel, of Michigan State University.

An Australian ageing expert, Dr Robin Holliday, disagrees. "It's totally irresponsible nonsense," says Holliday, formerly of the CSIRO.

Other experts at the conference are setting their sights on an industry that has burgeoned in the US, selling unproven pills and potions to slow ageing. Professor Thomas Perls, of Boston University, claims it "engenders a pernicious societal bias against older people".

Scientific advances in understanding

longevity are beginning to be made. But "any responsible pursuit of therapies has been completely overshadowed by a greedy, amoral and dangerous industry".

He singles out the use of human growth hormone as an anti-ageing treatment as "the most blatant and organised instance of quackery today".

In the next 20 years the number of people aged 60 or over will double to 1.2 billion and the figure will be more than 2 billion by 2050.

Given the seriousness of the issue, the longevity conference has backing from the World Health Organisation. But its unlikely organisers are a Byron Bay criminal lawyer, John Weller, and his son Noah, a naturopath.

The Weller family have spent $1 million on the conference and the launch of the Sydney-based non-profit International Research Centre for Healthy Ageing and Longevity, which will run annual conferences for the next 10 years.

John Weller says he was moved to action by the frustration of seeing his parents and grandparents in old age move in and out of hospitals and nursing homes. "Our philosophy is to bring together world experts in healthy ageing and longevity for the betterment of humankind," he says. This includes alternative

approaches, and presentations by scientists are interspersed with sessions on yoga, complementary medicine, Eastern longevity strategies and even a performance on a Native American flute. Clown doctor Patch Adams and environmentalist Dr David Suzuki are also attending.

"We wanted a conference with a warm-hearted environment," says Weller, who adds that formal presentations of non-orthodox medicine are evidence-based.

Holliday says the misconception that ageing is a mysterous process persists. But it is now well understood.

In mammals at least 10 maintenance mechanisms have been identified that help repair damaged DNA or the immune system, or other problems. The better the maintenance system, the longer-lived the creature.

Our system is relatively good. But it's not perfect. "Eventually maintenance becomes less capable of dealing with accumulation of the multiplicity of defects in organ systems which have not evolved to last more than a life span," he says.

Holliday says doctors tend to treat diseases as different entities, but they are all part of the ageing process. Better understanding of the cellular mechanisms that cause diseases will help delay their onset.

"That's the challenge of the 21st century," he says.

People wouldn't live that much longer as a result, he says. Some experts put the gain at only 15 years. But health costs would be much reduced.

In animals, breeders have been able to select for longevity genes to produce long-lived varieties of dogs, horses and cattle. "People say you should choose your parents wisely," says Fossel. "But you can't, of course."

A conference speaker, Dr Natalia Gavrilova, of the University of Chicago, has shown that if you want to live beyond 80 you had better hope you have other close long-lived relatives, because genes, rather than environment, are most influential in survival into the ninth decade.

Having a mature dad is bad news for girls. "Daughters conceived to older fathers live shorter lives, while sons are not affected," she says.

Dr Nir Barzilai in New York has also studied 300 Ashkenazim Jews who have lived to 100. The 70- and 80-year-old children of centenarians inherit significantly better health, he has found, with 50 per cent less diabetes and 60 per cent fewer heart attacks than normal.

He has also recently identified a genetic mutation in a gene that

controls levels of good cholesterol that triple the chance of getting from 70 to 100. The research could lead to new drugs to help everyone live longer, says Barzilai, of Albert Einstein College of Medicine.

The extraordinarily long-lived worms in California were made by reducing the activity of a gene called daf-2, as well as removing the worms' reproductive tissues. In humans, similar genes are involved in the production of insulin and control of growth and metabolism. And studying this pathway, and possible drugs that could regulate it, is becoming a major area of ageing research.

Fossel's preferred approach is to reset genes. Genes in an old cell are the same as those in a young cell, except that over time some have become more or less active. It's like an orchestra playing the wrong score, he says.

Substances such as telomerase could be used to make the genes play the right young tune again, he says. It's been done to turn old skin cells into new ones in the lab. The approach could be tried now in a dozen or so people, for example, to repair ulcered skin, he says. "It just takes money, about $3-$4 million."

The scepticism of people like Holliday doesn't worry him.

Eating less also works, says George

Roth, of the US National Institute of Health. "Calorie restriction is the only intervention conclusively shown to slow ageing and maintain health and vitality."

People on the Japanese island of Okinawa, for example, who consume 40 per cent fewer calories than Americans, live an average four years longer. The life spans of mice have been extended by as much as 50 per cent, simply by restricting food intake.

Roth says people would find it difficult to stick to a diet that reduces calories by the 30-40 per cent necessary. Holliday adds that animals on caloric restriction also shut down their reproduction systems. "They become infertile and have no sexual drive. That's not very desirable."

Roth, however, says there is now fierce competition to develop drugs and dietary supplements that mimic the effects of caloric restriction, without limiting food restriction. Hopefully, one day, it will be a case of "having one's cake and eating it too", he says.

In the meantime, just give up the cake, if you want to live longer, says molecular biologist Professor Brian Morris, of the University of Sydney.

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