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outlook

Listening to public concerns about human life extension

The public view of life-extension technologies is more nuanced than expected and researchers must engage in discussions if they hope to promote awareness and acceptance

Brad Partridge, Jayne Lucke & Wayne Hall

There is increasing research and commercial interest in the development of novel interventions that might be able to extend human life expectancy by decelerating the ageing process. In this context, there is unabated interest in the life-extending effects of caloric restriction in mammals, and there are great hopes for drugs that could slow human ageing by mimicking its effects (Fontana *et al*, 2010). The multinational pharmaceutical company GlaxoSmithKline, for example, acquired Sirtris Pharmaceuticals in 2008, ostensibly for their portfolio of drugs targeting 'diseases of ageing'. More recently, the immunosuppressant drug rapamycin has been shown to extend maximum lifespan in mice (Harrison *et al*, 2009). Such findings have stoked the kind of enthusiasm that has become common in media reports of life-extension and anti-ageing research, with claims that rapamycin might be "the cure for all that ails" (Hasty, 2009), or that it is an "anti-aging drug [that] could be used today" (Blagosklonny, 2007).

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Given the academic, commercial and media interest in prolonging human lifespan—a centuries-old dream of humanity—it is interesting to gauge what the public thinks about the possibility of living longer, healthier lives, and to ask whether they would be willing to buy and use drugs that slow the ageing process. Surveys that have addressed these questions, have given some rather surprising results, contrary to the expectations of many researchers in the field. They have also highlighted that although human life extension (HLE) and ageing are topics with enormous implications for society and individuals, scientists have not communicated efficiently with the public about their research and its possible applications.

...it might be that advocates of HLE have failed to persuade the public on this issue

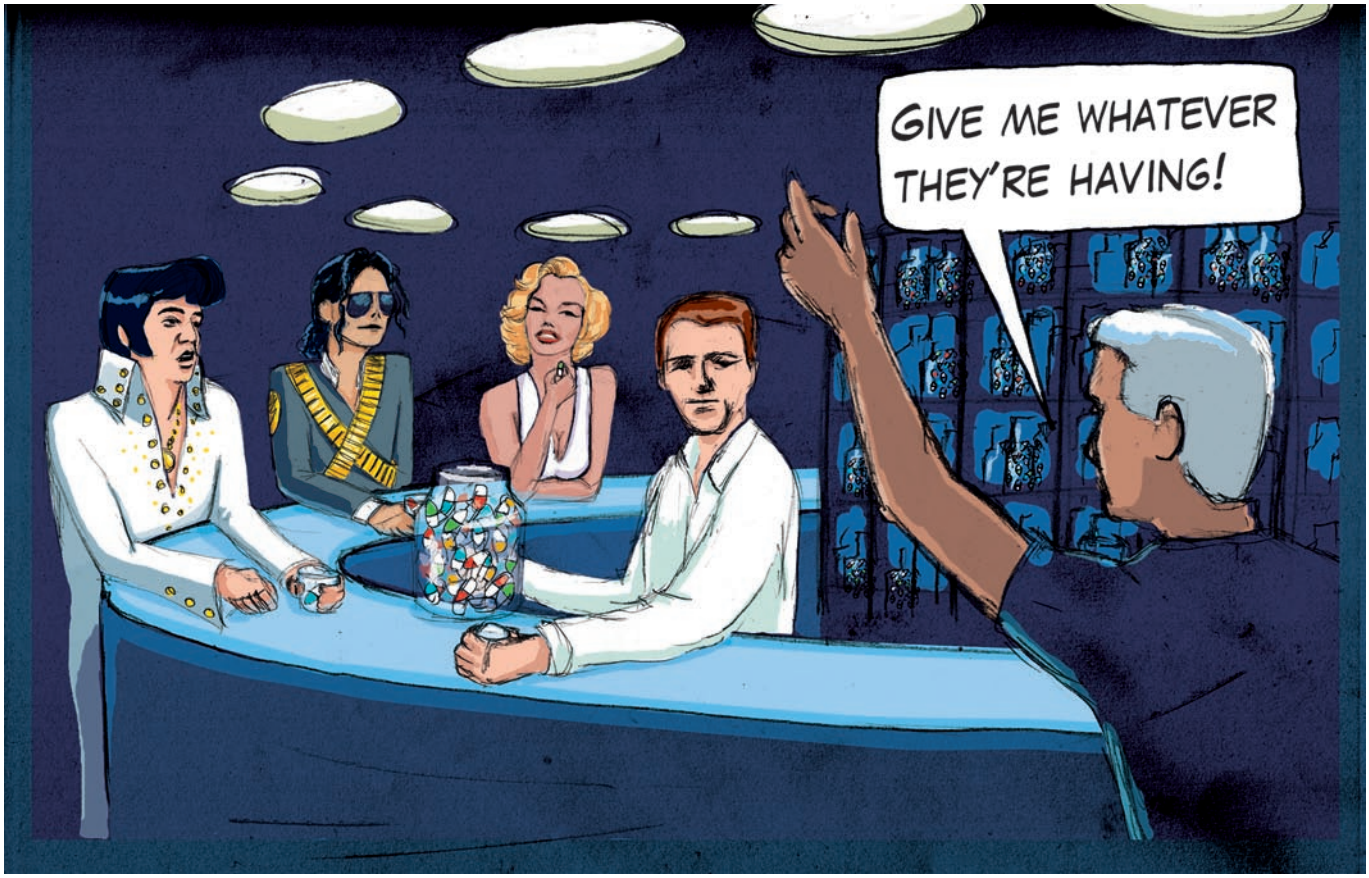
Proponents and opponents of HLE often assume that public attitudes towards ageing interventions will be strongly for or against, but until now, there has been little empirical evidence with which to test these assumptions (Lucke & Hall, 2005). We recently surveyed members of the public in Australia and found a variety of opinions, including some ambivalence towards the development and use of drugs that could slow ageing and increase lifespan. Our findings suggest that many members of the public anticipate both positive and negative outcomes from this work (Partridge 2009a,b, 2010; Underwood *et al*, 2009).

In a community survey of public attitudes towards HLE we found that around two-thirds of a sample of 605 Australian adults supported research with the potential to increase the maximum human lifespan by slowing ageing (Partridge *et al*, 2010). However, only one-third expressed an interest in using an anti-ageing pill if it were developed. Half of the respondents were not interested in personally using such a pill and around one in ten were undecided.

Some proponents of HLE anticipate their research being impeded by strong public antipathy (Miller, 2002, 2009). Richard Miller has claimed that opposition to the development of anti-ageing interventions often exists because of an "irrational public predisposition" to think that increased lifespans will only lead to elongation of infirmity. He has called this "gerontologiphobia"—a shared feeling among laypeople that while research to cure age-related diseases such as dementia is laudable, research that aims to intervene in ageing is a "public menace" (Miller, 2002).

We found broad support for the amelioration of age-related diseases and for technologies that might preserve quality of life, but scepticism about a major promise of HLE—that it will delay the onset of age-related diseases and extend an individual's healthy lifespan. From the people we interviewed, the most commonly cited potential negative personal outcome of HLE was that it would extend the number of years a person spent with chronic illnesses and poor quality of life (Partridge *et al*, 2009a). Although some members of the public envisioned more years spent in good health, almost 40% of participants were concerned that a drug to slow ageing would do more harm than good to them personally; another 13% were unsure about the benefits and costs (Partridge *et al*, 2010).

It would be unwise to label such concerns as irrational, when it might be that advocates



of HLE have failed to persuade the public on this issue. Have HLE researchers explained what they have discovered about ageing and what it means? Perhaps the public see the claims that have been made about HLE as 'too good to be true'.

Adverse side effects are acknowledged as a considerable potential challenge to the development of an effective life-extending drug in humans

Results of surveys of biogerontologists suggest that they are either unaware or dismissive of public concerns about HLE. They often ignore them, dismiss them as "far-fetched", or feel no responsibility "to respond" (Settersten Jr *et al*, 2008). Given this attitude, it is perhaps not surprising that the public are sceptical of their claims.

Scientists are not always clear about the outcomes of their work, biogerontologists included. Although the life-extending effects of interventions in animal models are invoked as arguments for supporting anti-ageing research, it is not certain that these interventions will also extend healthy lifespans in humans. Miller (2009) reassuringly claims that the available evidence consistently suggests that quality of life is maintained in laboratory animals with extended lifespans, but he acknowledges that the evidence is "sparse" and urges more research on the topic (Miller, 2009). In the light of such ambiguity, researchers need to respond to public concerns in ways that reflect the available evidence and the potential of their work, without becoming apostles for technologies that have not yet been developed. An anti-ageing drug that extends lifespan without maintaining quality of life is clearly undesirable, but the public needs to be persuaded that such an outcome can be avoided.

The public is also concerned about the possible adverse side effects of anti-ageing drugs. Many people were bemused when they discovered that members of the Caloric Restriction Society experienced a loss of libido and loss of muscle mass as a result of adhering to a low-calorie diet to extend their longevity—for many people, such side effects would not be worth the promise of some extra years of life. Adverse side effects are acknowledged as a considerable potential challenge to the development of an effective life-extending drug in humans (Fontana *et al*, 2010). If researchers do not discuss these possible effects, then a curious public might draw their own conclusions.

Some HLE advocates seem eager to tout potential anti-ageing drugs as being free from adverse side effects. For example, Blagosklonny (2007) has argued that rapamycin could be used to prevent age-related diseases in humans because it is "a non-toxic, well tolerated drug that is suitable for everyday oral administration" with its major "side-effects" being anti-tumour, bone-protecting, and mimicking caloric restriction effects. By contrast, Kaeberlein & Kennedy (2009) have advised the public against using the drug because of its immunosuppressive effects.

Aubrey de Grey has called for scientists to provide more optimistic timescales for HLE on several occasions. He claims that public opposition to interventions in ageing is based on "extraordinarily transparently flawed opinions" that HLE would be unethical and unsustainable (de Grey, 2004). In his

view, public opposition is driven by scepticism about whether HLE will be possible, and that concerns about extending infirmity, injustice or social harms are simply excuses to justify people's belief that ageing is 'not so bad' (de Grey, 2007). He argues that this "pro-ageing trance" can only be broken by persuading the public that HLE technologies are just around the corner.

Contrary to de Grey's expectations of public pessimism, 75% of our survey participants thought that HLE technologies were likely to be developed in the near future. Furthermore, concerns about the personal, social and ethical implications of ageing interventions and HLE were not confined to those who believed that HLE is not feasible (Partridge *et al*, 2010).

Juengst *et al* (2003) have rightly pointed out that any interventions that slow ageing and substantially increase human longevity might generate more social, economic, political, legal, ethical and public health issues than any other technological advance in biomedicine. Our survey supports this idea; the major ethical concerns raised by members of the public reflect the many and diverse issues that are discussed in the bioethics literature (Partridge *et al*, 2009b; Partridge & Hall, 2007).

When pressed, even enthusiasts admit that a drastic extension of human life might be a mixed blessing. A recent review by researchers at the US National Institute on Aging pointed to several economic and social challenges that arise from longevity extension (Sierra *et al*, 2009). Perry (2004) suggests that the ability to slow ageing will cause "profound changes" and a "firestorm of controversy". Even de Grey (2005) concedes that the development of an effective way to slow ageing will cause "mayhem" and "absolute pandemonium". If even the advocates of anti-ageing and HLE anticipate widespread societal disruption, the public is right to express concerns about the prospect of these things becoming reality. It is accordingly unfair to dismiss public concerns about the social and ethical implications as "irrational", "inane" or "breathtakingly stupid" (de Grey, 2004).

The breadth of the possible implications of HLE reinforces the need for more discussion about the funding of such research and management of its outcomes (Juengst *et al*, 2003). Biogerontologists need to take public concerns more seriously if they hope to foster support for their work. If there are misperceptions about the likely outcomes of intervention in ageing, then biogerontologists need to better explain their research to the public and discuss how their concerns will be addressed. It is not enough to hope that a breakthrough in human ageing research will automatically assuage public concerns about the effects of HLE on quality of life, overpopulation, economic sustainability, the environment and inequities in access to such technologies. The trajectories of other controversial research areas—such as human embryonic stem cell research and assisted reproductive technologies (Deech & Smajdor, 2007)—have shown that "listening to public concerns on research and responding appropriately" is a more effective way of fostering support than arrogant dismissal of public concerns (Anon, 2009).

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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REFERENCES

Anon (2009) Editorial: By common consent. *Nature* **458:** 125

Blagosklonny MV (2007) An anti-aging drug today: from senescence-promoting genes to anti-aging pill. *Drug Discov Today* **12:** 218–224

Deech R, Smajdor A (2007) *From IVF to Immortality: Controversy in the Era of Reproductive Technology.* Oxford, UK: Oxford University Press

de Grey A (2004) Biogerontologists' duty to discuss timescales publicly. *Ann NY Acad Sci* **1019:** 542–545

de Grey A (2005) Curing ageing and the consequences. *EMBO Rep* **6:** 198–201

de Grey A (2007) Life span extension research and public debate: societal considerations. *Stud Ethics Law Technol* **1:** Article 5

Fontana L, Partridge L, Longo VD (2010) Extending healthy life span—from yeast to humans. *Science* **328:** 321–326

Harrison D *et al* (2009) Rapamycin fed late in life extends lifespan in genetically heterogeneous mice. *Nature* **460:** 392–395

Hasty P (2009) Rapamycin: The cure for all that ails. *J Mol Cell Biol* **2:** 17–19

Juengst ET, Binstock RH, Mehlman MJ, Post SG (2003) Antiaging research and the need for public dialogue. *Science* **299:** 1323

Kaeberlein M, Kennedy BK (2009) A midlife longevity drug? *Nature* **460:** 331–332

Lucke JC, Hall W (2005) Who wants to live forever? *EMBO Rep* **6:** 98–102

Miller RA (2002) Extending life: scientific prospects and political obstacles. *Milbank Q* **80:** 155–174

Miller RA (2009) " Dividends " from research on aging—can biogerontologists, at long last, find something useful to do? *J Gerontol A Biol Sci* **64A:** 157–160

Partridge B, Hall W (2007) The search for Methuselah: should we endeavour to increase the maximum human lifespan? *EMBO Rep* **8:** 888–891

Partridge B, Lucke J, Bartlett H, Hall W (2009a) Ethical, social and personal implications of extended human life-span identified by members of the public. *Rejuvenation Res* **12:** 351–357

Partridge B, Underwood M, Lucke J, Bartlett H, Hall W (2009b) Ethical concerns in the community about technologies to extend human life span. *Am J Bioeth* **9:** 68–76

Partridge B, Lucke J, Bartlett H, Hall W (2010) Public attitudes towards human life-extension by intervening in ageing. *J Aging Stud* (in press)

Perry D (2004) Someone's knocking on the laboratory door. *Rejuvenation Res* **7:** 49–52

Settersten RA Jr, Flatt MA, Ponsaran R (2008) From the lab to the front line: how individual biogerontologists navigate their contested field. *J Aging Stud* **22:** 304–312

Sierra F, Hadley E, Suzman R, Hodes R (2009) Prospects for life span extension. *Annu Rev Med* **60:** 457–469

Underwood M, Bartlett HP, Partridge B, Lucke J, Hall WD (2009) Community perceptions on the significant extension of life: An exploratory study among urban adults in Brisbane, Australia. *Soc Sci Med* **68:** 496–503

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