

Comment

## Twilight of a hero

Gregory A Petsko

Address: Rosenstiel Basic Medical Sciences Research Center, Brandeis University, Waltham, MA 02454-9110, USA.  
E-mail: [petsko@brandeis.edu](mailto:petsko@brandeis.edu)

Published: 28 September 2004

*Genome Biology* 2004, **5**:116

The electronic version of this article is the complete one and can be found online at <http://genomebiology.com/2004/5/10/116>

© 2004 BioMed Central Ltd

At the height of his fame, he could walk past a monastery in Tibet and Buddhist monks would look up from their prayer wheels, point their bony fingers, and shout out his name. He has always been one of my heroes, not for what he did in the boxing ring (though that was magical, almost more ballet than prizefighting, at least in his early years), but for what he said and did outside of it. In the late 1960s, when, like a lot of other young men, I was trying to prove to people, including myself, that being against the Vietnam War didn't necessarily mean that you were a coward, he went to jail for refusing to be drafted into what he considered an unjust war ("No Vietcong," he said memorably, "ever called me a nigger."). With that gesture, the problem was solved. No one could ever accuse Mohammed Ali of being a coward.

Now he is a shaking, slurred-speaking shadow of that quick-witted, loud-mouthed, powerful, graceful young man. Parkinson's Disease has done what no single opponent, not even the United States government, could do: it has taken away the essence of the man and left us with a shadow - externally, for the real cruelty of Parkinson's is that its victims are usually fine mentally. They know exactly what is happening to them, they simply can no longer control their bodies because the dopaminergic neurons in the substantia nigra of their midbrain, the region that generates smooth movement, are dying.

Mohammed Ali's Parkinson's Disease was brought on by inflammation caused by years of repeated trauma to the brain from his chosen profession. It will kill him eventually, as it does most sufferers unless they die of something else first. Over a period of about twenty years, the afflicted slowly lose all voluntary mobility, becoming prisoners inside their bodies, until at last, unable to even swallow, they succumb to pneumonia or some other proximate cause of death. Parkinson's is an ancient disease, and it is likely that some of the fables of people turning to stone (the Medusa's lethal gaze in Greek mythology; the petrification of trolls in Scandinavian legends - virtually every country has such stories) represent

attempts by primitive people to explain something that must have seemed an incomprehensible horror.

The same fate awaits the actor Michael J. Fox, whose Parkinson's Disease is probably the result of some genetic flaw, given that its age of onset was so early. It also awaits Pope John Paul II, whose Parkinson's appeared in old age, as it most often does. The disease affects around 1% of those over 65; their condition is referred to as idiopathic or 'sporadic' Parkinson's, since no single cause, genetic or otherwise, has been identified. (Like a lot of other 'sporadic' disorders, including Type I Diabetes, Alzheimer's Disease (the non-familial form) and schizophrenia, Parkinson's Disease is probably polygenic, with multiple contributing factors that dispose towards getting it, combined perhaps with environmental factors.) That fate also awaits the close to 1 million Americans and millions worldwide who currently suffer from this affliction.

And if US President George W. Bush and others in his administration have their way, that fate is certain. Currently there is no effective treatment for Parkinson's Disease; dopamine replacement is palliative only and loses its effectiveness over time. Despite some new therapies that seem to help ease the disease's debilitating symptoms in some patients, nothing can either replace the faulty nerve cells that cause the disease or stop Parkinson's from progressing. Medical care for those afflicted with Parkinson's, combined with their loss of productivity, cost US\$ 5.6 billion a year in the US alone, and right now there is only one real hope for these sufferers. That hope is embryonic stem (ES) cell therapy, which depends on research that the Bush administration is doing its best to strangle.

They will tell you otherwise, but they're not telling the truth. In a recent speech, Laura Bush, the President's wife, claimed that Bush is the only president to authorize federal funding for (ES) cell research. That is true, but no other president ever had the opportunity before. She went on to claim that

this authorization has led to \$25 million in federal grants last year. Also true, but misleading: \$25 million is an insignificant sum for such work, and the reason the amount is so small is that Bush has hamstrung those trying to do the research with untenable restrictions. In an address to the nation in July of 2001, Bush prohibited the use of federal funds to create new lines of ES cells or to carry out research using lines so created. He stated that federal funds could be used to work with any of the 78 lines of ES cells then in existence, but this was disingenuous for several reasons. First, only about 20 of these lines were thought suitable for most studies - as has proven to be the case. Second, none of these lines were genetically matched to any patient, the most important direction of research for disease treatment, and under the Bush guidelines no patient-matched lines could be created with government support and no federally funded research could be done with them regardless of where they came from. These restrictions have had two consequences: to drive some stem cell researchers out of the US to Europe (especially Great Britain) or Australia, where policies are more enlightened, and to force US-based scientists to try to find private support (from industry or foundations, such as the Howard Hughes Medical Institutes). And the whole notion that the Bush administration has been supportive of ES-cell research within limits is also disingenuous, because it is very clear that the ultimate objective is to ban it completely, regardless of the source of funds. The US House of Representatives passed just such an administration-supported ban last year, but the Senate defeated it. If the Republicans hold onto their majority in the upcoming elections this November, a ban is certain to be brought up again.

Moreover, the Bush administration is trying to export its policy to the rest of the world. On Monday 8 December 2003, the United Nations General Assembly almost voted to ban all forms of human cloning, both reproductive and therapeutic (ES cell research is sometimes referred to, inappropriately and foolishly in my view, as therapeutic human cloning). In the end, it was decided to delay action to allow more deliberation. Sometime this fall the matter will probably be reconsidered. The United States is a prime sponsor of the resolution, along with - here's an example of strange bedfellows if ever there was one - a group of fundamentalist Muslim countries.

What is so controversial about a technology that has the potential to help people who suffer from incurable conditions such as Parkinson's and Alzheimer's Diseases, spinal injuries, and Type I (juvenile onset) Diabetes, all of which are characterized by the loss of particular types of cells and therefore can only really be cured by the generation of replacement cells? The crux of the matter lies in the way in which new lines of ES cells are created, a process most properly called somatic cell nuclear transfer (SCNT). In this procedure, the nucleus of an unfertilized egg is removed and replaced with, for example, the nucleus of a patient's own cells (including skin, heart and nerve cells), which are called

somatic cells. When the resulting egg has divided into a small number of stem cells, which have not yet differentiated but are capable of doing so, these cells can be harvested for research or for disease treatment. The goal of SCNT is to develop stem cells that will not be rejected or destroyed by the patient's immune system and that can differentiate into any desired cells, such as neurons of the substantia nigra, or pancreatic islet cells. Somatic cell nuclear transfer could thus, in principle, allow patients to be cured using their own DNA. To call it a form of human cloning demonizes it by associating it with cloning for reproductive purposes, and ignores the fact that SCNT produces only stem cells, never babies. No sperm is used in SCNT and the cells are not transplanted into any womb. But religious conservatives object to the procedure because it involves the formation and subsequent destruction of a very early stage embryo (or, at least, destruction in the case of harvesting ES cells from existing embryos obtained from fertility clinics. Such ES cells would not be genetically matched to any person, but are still very useful; nearly all existing lines of ES cells have been obtained this way. Genetically matched ES cell lines are necessary to treat or model diseases, but their creation is a new development.)

I have a great deal of respect for those who are against this research for sincerely held, consistent moral beliefs, although I disagree with them. But I'm not sure the Bush administration fits that description. There is much in the administration's words and actions to suggest that this issue is actually a stalking-horse for something else: an attempt to ban all forms of pregnancy termination (abortion), even in cases of rape and incest. And I have a problem with the inconsistency of claiming to be pro-life by favoring embryos whose status as 'living' is open to debate while condemning people who are unequivocally alive to certain death. That stance also ignores the suffering of their friends and families (to get a sense of what they go through, I recommend 'Saving Milly', by Morton Kondracke, published by Balantine Books: New York; 2001; if after reading it you can still argue that a collection of undifferentiated cells should take precedence over human beings like those in this book, then nothing I can say is likely to change your mind).

To be fair, scientists haven't helped themselves much in this debate. Like gene therapy and the war on cancer and the human genome project, stem-cell research has been oversold by some, especially for Alzheimer's Disease where its applications are tenuous and very far away. Replacement of cognitive neurons, with their complex web of synapses, is likely to be extremely difficult. Nor will it replace the lost memories that are a large part of the burden of the disease - for we are our memories, they create the shape of our life. But for Type II diabetes, spinal cord injuries, Parkinson's Disease and other motor neuron diseases, it really does represent, in my opinion, the most promising line of research at the moment.

Ron Reagan, the son of the late President Ronald Reagan, understands that well. At the Democratic National Convention

in Boston at the end of July, he spoke with passion and eloquence about the importance of embryonic stem-cell research. The whole speech is worth reading (you can find a transcript online at [<http://politicalgateway.com/news/read.html?id=535>]); here are some parts of it: “There are those who would stand in the way of this remarkable future, who would deny the federal funding so crucial to basic research. They argue that interfering with the development of even the earliest stage embryo, even one that will never be implanted in a womb and will never develop into an actual fetus, is tantamount to murder. A few of these folks, needless to say, are just grinding a political axe and they should be ashamed of themselves. But many are well-meaning and sincere. Their belief is just that, an article of faith, and they are entitled to it. But it does not follow that the theology of a few should be allowed to forestall the health and well-being of the many. And how can we affirm life if we abandon those whose own lives are so desperately at risk? It is a hallmark of human intelligence that we are able to make distinctions. Yes, these cells could theoretically have the potential, under very different circumstances, to develop into human beings - that potential is where their magic lies. But they are not, in and of themselves, human beings. They have no fingers and toes, no brain or spinal cord. They have no thoughts, no fears. They feel no pain. Surely we can distinguish between these undifferentiated cells multiplying in a tissue culture and a living, breathing person - a parent, a spouse, a child...

“What might we tell... the millions of others who suffer? That when given an opportunity to help, we turned away? That facing political opposition, we lost our nerve? That even though we knew better, we did nothing? And, should we fail, how will we feel if, a few years from now, a more enlightened generation should fulfill the promise of embryonic stem cell therapy? Imagine what they would say of us who lacked the will... The tide of history is with us. Like all generations who have come before ours, we are motivated by a thirst for knowledge and compelled to see others in need as fellow angels on an often difficult path, deserving of our compassion... We have a chance to take a giant stride forward for the good of all humanity. We can choose between the future and the past, between reason and ignorance, between true compassion and mere ideology. This is our moment, and we must not falter.”

I hope our leaders will find the wisdom to heed his call. Even if they do, any cure for Parkinson's Disease will certainly come too late to save Mohammed Ali. But if his suffering moves even a few to the compassion needed to support the best hope for those like him, then his torment will have meant something. The death of a hero should have some meaning.