THE CRUSADER

Theresa Deisher once shunned religion for science. Now, with renewed faith, she is fighting human-embryonic-stem-cell research in court.

BY MEREDITH WADMAN

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Theresa Deisher was 17 years old the first time she saw a human fetus. Having graduated from the Holy Names Academy in Seattle, Washington, in 1980, she had taken a summer job in the pathology lab at the city's Swedish Hospital when a friend and co-worker miscarried in her fifth month of pregnancy. The fetus arrived fixed in formalin, and Deisher helped to section it to determine the cause of the miscarriage. The body hardly seemed to be the remains of a sentient, soul-bearing human, as the faith of her upbringing had taught, recalls Deisher. Instead, "It looked like a space alien," she says. "I called it 'the thing' for so many years."

Thirty years later, Deisher sees the unborn in a different light. She has reversed her views on embryos and become one of two plaintiffs in a lawsuit filed in 2009, seeking to stop the US government from funding human-embryonic-stem-cell research. The courts hearing the case could issue a decision at any time; many, including Deisher, expect that the matter will end up before the US Supreme Court.

Deisher's co-plaintiff, James Sherley, an adult-stem-cell scientist at the Boston Biomedical Research Institute in Watertown, Massachusetts, is well known as a provocateur. In 2007, he went on a hunger strike to protest against a decision by the Massachusetts Institute of Technology (MIT) in Cambridge to deny him tenure, which he attributed to racism.

Deisher is less well known. A cellular physiologist educated at Stanford University in Palo Alto, California, she spent 17 years in the biotech industry at companies including Genentech, Immunex and Amgen. Three years ago, she founded a tiny, privately held Seattle firm called AVM Biotechnology — the name is a loose abbreviation for 'Ave Maria' — which is dedicated to hastening adult-stem-cell therapies to the market, and to developing alternatives to vaccines and therapeutics made using cell lines from aborted fetuses. She has also launched a non-profit group, the Sound Choice Pharmaceutical Institute, which among other things is investigating, as she puts it, "the potential link between human DNA in childhood vaccines and autism".

> ***"She's kind of the Sarah Palin of stem cells."***

Deisher, who is 48 and goes by the name Tracy, is smart, driven and committed. A devout Catholic and a divorced mother of two boys aged 9 and 12, she rises as early as 3:45 a.m. to ride an exercise bike while praying the rosary. She is casual and unpretentious, with a dry humour and a can-do attitude: she spent New Year's Eve laying carpet in the 180-square-metre office space that her company recently moved into.

She is also a bundle of contradictions: an adamant right-to-lifer, whose closest, long-standing friends are pro-choice liberals. She made a healthy six-figure salary at the cream of US biotech companies, but thought nothing of mortgaging it all to launch a no-name firm as the economy slid into a recession. She is a no-frills dresser who has worn a simple gold cross virtually every day for the past 18 years. But she flaunts her intellect. In the past, she alienated friends with a formidable vocabulary fed by a dictionary-reading habit. And she says that those at her church who disagree with her stem-cell views "oftentimes need some education".

Above all, Deisher is supremely confident in her positions, including her attempt to prevent hundreds of millions of dollars from going to human-embryonic-stem-cell research. "It's very difficult to get passionately, morally protective of what physically truly is a clump of cells," she says. "But that is a human being. Scientifically, you can't debate that."

Her arguments, now part of a national discussion, can be hyperbolic. And she does not shy away from assigning motivations to her ideological foes. She says, for example, that embryonic-stem-cell scientists are mostly attracted to the cells' convenience — their rapid growth and what she calls the ease of working with them in the lab. Their science, she says, "is not about helping patients and it's not about advancing the common good".

"I wish that Tracy weren't so polarizing," says Chuck Murry, co-director of the Institute for Stem Cell and Regenerative Medicine at the University of Washington in Seattle, who has known Deisher since they were postdocs together at the university in the early 1990s. "She's kind of the Sarah Palin of stem cells. It would be so much easier to have more rational discourse rather than somebody who heats up the vitriol like this." Deisher counters that she sticks to scientific arguments: "My approach to the stem-cell issue is to remove the polarizing moral debates and speak and educate only about the science."

REGAINING THE FAITH

Deisher showed a bent for science early, teaching herself calculus to win a state competition in which high-school students had to plot the orbit of Mars and design a spaceship and flight path to get there. "Tracy was always very much a leader, an independent thinker," says Liz Swift, who taught Deisher physics at Holy Names and is now the school's principal. In those days, a fun Friday night for Deisher meant several hours at the University of Washington's astrophysics laboratory, followed at 10 p.m. by an outing with girlfriends — only after her mother had checked her for make-up and low necklines.

As a girl, Deisher was torn between her mother's conviction that life began at conception and the views of her two outspoken aunts, both staunch supporters of Planned Parenthood, who reminded her regularly: "It's not a baby. It's a clump of cells." Deisher's experience as a teenager in the Swedish Hospital pathology lab left her without any doubts as to who was right. "I walked out of that lab that weekend and I threw my faith in the garbage can," she recalls.

Weeks after her experience with the fetus, Deisher began undergraduate studies at Stanford, where she went on to earn her PhD in molecular and cellular physiology. On the side, she worked at Genentech in South San Francisco, California, developing assays to support the company's anti-platelet agents. "I was very left-wing," she says. "I was in science, and science was much more interesting than religion. I encouraged a couple of friends to have abortions," urging them to trust her first-hand experience with a fetus in formalin.

Several years later, during an anatomy lab, she encountered the cadaver of a woman also embedded in formalin — looking, she says, not so very different from "the thing". It suddenly struck her that the fetus's 'alien' looks may have simply been attributable to the preservation process. That opened up what she calls "a long, slow process" of coming back to the faith of her childhood. It was one of three pivotal experiences that she talks about as having influenced her decision to actively fight against embryonic-stem-cell research.

After completing a postdoctoral fellowship at the University of Washington in 1993, Deisher went to work for the biotech company Repligen in Waltham, Massachusetts, working on monoclonal-antibody therapeutics. After watching three rounds of lay-offs, Deisher decamped to a Seattle company called Zymogenetics, where she became involved in a cardiovascular-biology group.

Soon after she arrived at the firm in 1995, Deisher isolated what seemed to be pluripotent stem cells from adult cardiac muscle. They differentiated, she says, into cell types including heart muscle, skeletal and smooth muscle, connective tissue, skin, bone and cartilage. "People would come into the lab and they would practically start to drool," Deisher recalls. "It was mind-boggling what these cells became." In March 1998 — 8 months before the first report that human embryonic stem cells had been isolated — the company filed a patent application on the cells, with Deisher listed as first inventor.

It was, and still is, a controversial claim. Kenneth Chien, an expert in studies of heart progenitor cells at the Department of Stem Cell and Regenerative Biology at Harvard University in Cambridge,

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STEM CELLS IN COURT

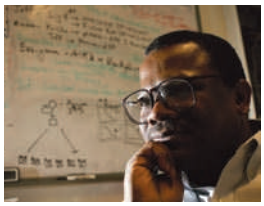
The bid to extend federal funding of human embryonic-stem-cell research has sparked a bitter legal battle.

9 MARCH 2009

President Barack Obama rescinds Bush-era restrictions and sets a policy allowing liberalized funding for human embryonic-stem-cell research.

19 AUGUST 2009

Plaintiffs James Sherley, Theresa Deisher, 'embryos' and various others file a lawsuit contesting the legality of funding human embryonic-stem-cell research.



27 OCTOBER 2009

The case is dismissed when the District of Columbia circuit court rules that the plaintiffs have no standing in the case.

25 JUNE 2010

The US Court of Appeals grants standing to Deisher and Sherley alone owing to the competition for limited NIH resources.

23 AUGUST 2010

Judge Royce Lamberth of the District of Columbia Circuit Court grants a preliminary injunction ordering the termination of federal funding to embryonic-stem-cell research under the new regulations.

Massachusetts, says that "nobody has been able to identify a truly pluripotent stem cell from any adult mammalian heart".

Many of her colleagues at Zymogenetics reacted with "ferocious hostility", Deisher says. She recalls one scientist who cornered her, spittle flying from her mouth, shouting: "Adult stem cells do not exist outside the haematopoietic system! Who the blank do you think you are, God?" Deisher was ordered, she says, to stop working on the cells.

The company abandoned the patent application in 2004, but Deisher remains unapologetic about her claims. The website for AVM proclaims: "Dr. Deisher was the first person world-wide to identify and patent stem cells from the adult heart. Her discovery remains one of the most significant discoveries in the area of stem cell research." And the vehemence with which colleagues resisted "made me open my eyes", Deisher says, to the very real — and, she says, unscientific — passions that can infect defenders of scientific orthodoxy. Science, she reasoned, was not so objective after all.

It was a second formative experience for her. Deisher had returned to religion, tentatively, in the early 1990s. Now, her disillusionment with colleagues at Zymogenetics "led me back deeply and profoundly", she says. She left the company for Immunex — which was acquired by Amgen in 2002. Human embryonic stem cells were back in the news, as president George W. Bush defined a policy that allowed federal funding for research on a score of existing cell lines. For Deisher, it was a score too many. "I was extremely disappointed," she says. She felt the policy encouraged an unmerited hype around embryonic cells that deprived adult-stem-cell therapies of support.

Through a friend of her parents, Deisher came into contact with Sharon Quick, a local doctor and conservative activist, who invited her in 2006 to speak on a televised panel about stem-cell research. Murry had also been invited to speak. He recalls Deisher reading prepared remarks about human-embryonic-stem-cell research. "There was a lot of misinformation in there." Her talk, he says, "didn't educate and focus. It obfuscated and frightened."

In response to Murry's criticism, Deisher sent *Nature* a copy of the talk. It argues that human embryonic stem cells could provoke an immune response and form teratomas (tumours containing various types of cell); claims that safe, "clinically proven" alternatives exist; and categorically dismisses any potential promise embryonic cells may offer: "There is no commercial, clinical or research utility in working with human embryonic stem cells." The event put Deisher on the map for anti-embryonic-stem-cell activists. It also led her to a third transformative moment in her advocacy.

In early 2007, Deisher was invited to speak to a group of Republican state lawmakers in Olympia, Washington. One of the other speakers was a mother who had adopted a frozen embryo from a fertility clinic. The resulting child, a girl then four years old, stood beside her.

Deisher was transfixed. It was, she says, "the turning point to become less scientific about it, and actually feel emotion, and a stronger sense of commitment".

It was this commitment that led Deisher to found AVM in February 2008. The company's mission, in part, is to eliminate the need for embryonic-stem-cell therapies and enable adult-stem-cell companies to succeed by developing, for instance, drugs that promote stem-cell retention in target organs. It is also working on alternatives to vaccines currently produced using cell lines derived from fetuses that had been aborted decades ago. AVM has five members of staff, all of whom are unpaid, and occupies three rooms in a former nurses' dormitory.

She financed AVM with her retirement savings, and with proceeds from the sale of her house. In 2009, an equity offering raised an additional $225,000 from 'angel' investors. Deisher's non-profit group, the Sound Choice Pharmaceutical Institute, is housed in the same premises and is staffed by four people. Last year, the institute won a $500,500 two-year grant from the MJ Murdock Charitable Trust, based in Vancouver, Washington, to study whether residual human DNA in the measles, mumps and rubella (MMR) vaccine might trigger autism. Stanley Plotkin, emeritus professor at the Wistar Institute in Philadelphia, Pennsylvania, and inventor of the rubella vaccine, calls the idea "off the wall". "The whole idea, in my view, is just pernicious and just raises a spectre which has been redundantly disproven." John Van Zytveld, a senior fellow at the Murdock trust, who oversees its science grants, says that Deisher's proposal "came back with a strong [peer] review and so we opted to support it".

A CALL TO ARMS

In the spring of 2009, Deisher got a call from Sam Casey, a lawyer then based in Fairfax, Virginia, who was representing Do No Harm, a coalition opposed to human-embryonic-stem-cell research. The US National Institutes of Health (NIH) in Bethesda, Maryland, had just issued draft guidelines proposing to open up funding for the research, complying with an executive order from President Barack Obama. Casey enlisted Deisher to help write the group's response.

He also told her that he was laying plans for a lawsuit if the final guidelines remained substantially unchanged from the draft. The suit would assert that the guidelines contravened an existing law, the Dickey–Wicker amendment, which prohibits federal funding of research in which human embryos are destroyed.

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For a podcast discussion with the author, see:
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The NIH published its final guidelines on 6 July 2009, allowing financial support for work on human embryonic stem cells derived ethically from leftover embryos at fertility clinics, but not for work that went into their derivation. "I was

OBAMA: D. MILLS/*NEW YORK TIMES*/REDUX/EYEVINE; SHERLEY: C. SUZUKI/AP; LAMBERTH: C. DHARAPAK/AP; CELLS: D. SCHARF/SCIENCE FACTION/CORBIS

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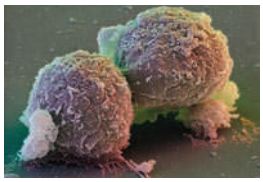
9 SEPTEMBER 2010

The US Court of Appeals issues a stay on the injunction allowing federal funds to flow once again to embryonic-stem-cell researchers until the legality of the injunction can be determined.



6 DECEMBER 2010

The Court of Appeals hears oral arguments.

Currently the District of Columbia district court could issue a summary judgement on the legality of the NIH guidelines or the US Court of Appeals could determine the fate of the preliminary injunction. Embryonic-stem-cell research could be halted again. Either way, the case is expected to go before the Supreme Court.

very disappointed," Deisher says. "I had hoped and thought that they would listen."

Soon afterwards, Casey, now with the Jubilee Campaign in Washington DC, called Deisher. He told her that the lawsuit was going ahead, and asked her to be one of the plaintiffs. She spent several weeks pondering her decision. "There are huge ramifications to being involved in a lawsuit," she says. "It is frightening to speak out. I don't care for the notoriety." Deisher was also keenly aware that James Sherley had signed on as a plaintiff. She had never met him, but she had followed his widely publicized tenure dispute with MIT. She worried about how a public association with him would affect her reputation.

She made it clear to Casey that if he wanted her as a plaintiff, a high-profile, Sherleyesque approach was out of bounds. "No theatrics, no histrionics, no hunger strikes," she says. It was agreed, and Deisher joined the suit. Her co-plaintiffs included 'embryos'; an embryo adoption agency called Nightlife Christian Adoptions; the Christian Medical and Dental Association based in Bristol, Tennessee; and individuals wishing to adopt embryos.

The lawsuit, filed in August 2009, was barely noted by the press. And when, in October that year, District of Columbia District Court Judge Royce Lamberth ruled that none of the plaintiffs had standing to sue, Deisher received the news with a measure of relief. She could return to her preferred focus: her children and her work.

But in June 2010, the US Court of Appeals for the District of Columbia Circuit ruled that Deisher and Sherley alone should be granted standing to sue, because, as adult-stem-cell researchers, they were in danger of 'imminent' injury. The court reasoned that by allowing federal funding of embryonic-stem-cell research the NIH increased competition for its limited funds, making it harder for adult-stem-cell researchers to win grants. The appeals court then sent the case back to Lamberth. Deisher was concerned. "It's a little unnerving to know that you are the only two with standing."

Unlike Sherley, Deisher has never applied for an NIH grant — as some opponents are quick to point out. She contends that she is still hurt by the guidelines, just as, by her reasoning, all adult-stem-cell researchers are hurt by the NIH's deliberate focus on embryonic stem cells. Moreover, she says, "I would like to, I intend to and I plan to" apply for NIH grants.

It is hard to argue that adult-stem-cell researchers are at a disadvantage, however. Numbers provided by the NIH show that since 2002, when it first funded a human-embryonic-stem-cell grant, the agency has spent more than four times as much — $2.3 billion — on research with non-embryonic human stem cells. Nor has the money for non-embryonic work dwindled as embryonic funding has grown; in 2003, the NIH spent $191 million on adult-stem-cell research in humans; last year, it spent $388 million.

Deisher responds that the United States lags in clinically testing new therapeutic uses for adult-stem-cells, instead focusing on well established indications such as leukaemia and lymphoma. Thirty-nine percent of adult-stem-cell trials for 'unconventional' indications registered with clinicaltrials.gov take place in the United States, compared with 71% of trials for 'conventional' uses. Defenders of the NIH say that lax regulatory and safety hurdles in some countries may explain the discrepancy. Sean Morrison, director of the Center for Stem Cell Biology at the University of Michigan in Ann Arbor, works on adult and embryonic stem cells, and says that "the idea that the NIH is biased against adult-stem-cell research is ridiculous".

THE HAMMER DROPS

On 23 August 2010, Lamberth issued a preliminary injunction siding with the plaintiffs. That immediately shut down federally funded human embryonic experiments, leaving the research community reeling and angry. Deisher's phone began ringing off the hook, with queries from reporters around the world. The next day, walking into her office in a building that shares space with other research groups, she was prepared for dirty looks. But "if I got them, I didn't notice. The response was overwhelmingly positive."

Deisher made a hastily arranged trip to Washington DC the next week. There, she met Sherley for the first time, during an hours-long strategy session at the offices of Gibson, Dunn and Crutcher, the DC law firm arguing the case. "I asked lots of questions," Deisher says. (Sherley "is a very nice man", she adds. "He's a good scientist.")

It would be 17 days from the preliminary injunction before a stay from the appeals court allowed embryonic-stem-cell research to resume. Since then, the lawsuit has been proceeding on two tracks. At the lower, district court, Judge Lamberth is considering both sides' requests for a speedy, 'summary' judgement on whether the NIH's guidelines are legal. The higher court, the Court of Appeals for the District of Columbia Circuit, which resides one level below the Supreme Court, is considering whether Lamberth met the legal standard for granting the preliminary injunction. Either court could rule at any time, and no matter what the decisions, appeals are expected (see 'Stem cells in court'). The case has taken "emotional energy", Deisher says, but not a great deal of her time. She has not hung on every one of its twists and turns. In many ways, her life goes on unchanged.

> ***"It is frightening to speak out. I don't care for the notoriety."***

Old friends, for example, remain old friends. Two former high-school classmates who recently visited Deisher at her office both adamantly oppose her position on the research, but greet her with evident warmth. "I can say wholeheartedly that I am envious of her passion," says one. But later, she e-mailed to ask that her name be withheld from this article. "I cannot afford to have a search engine associate me with an individual whose actions are in such opposition to the beliefs of my personal and professional community," she wrote.

The biggest lesson Deisher has learned from the lawsuit, she says, is "how many scientists are against [human-embryonic-stem-cell research]. I did not know that. I did not expect the level of support and encouragement that I have received." The extent of that support may be tested if the Court of Appeals for the District of Columbia Circuit, when it rules on the issue, agrees with Deisher. If it does, it will shut down hundreds of human-embryonic-stem-cell experiments once more — possibly for good. ■

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