

By Giving Life, Women May Add to Their Years

By Katelyn Foley

Who would have thought that pregnancy—nine months of mood swings, physical stresses, and bizarre cravings—could benefit a mother’s health for as long as 27 years after her pregnancy (1)? During pregnancy, a small number of fetal cells migrates to maternal tissues and blood.

Recent research at Tufts-New England Medical Center suggests that these fetal cells, some of which behave like stem cells, may later have reparative effects on the mother’s body (2).

This process, known as fetal cell microchimerism, refers to the long-term presence of fetal cells in maternal organs and circulation. First discovered in mice, fetal cell microchimerism happens without any visible graft-versus-host reactions, in which the fetus’ immune system attacks the mother’s body, or graft rejections, in which the mother’s immune system attacks the migrating fetal cells (2, 3, 4).

Some of these fetal cells have stem-cell-like qualities, such as self-renewal over a long period of time and the ability to give rise to specialized cells (5, 6). Also known as pregnancy-associated progenitor cells (PAPCs), these fetal cells have been found on damaged maternal organs (2).

The idea that fetal cells are beneficial to women’s health is a recent theory. In the past, researchers have suggested that fetal cells present in diseased tissues could be starting the disease by causing an autoimmune reaction. An

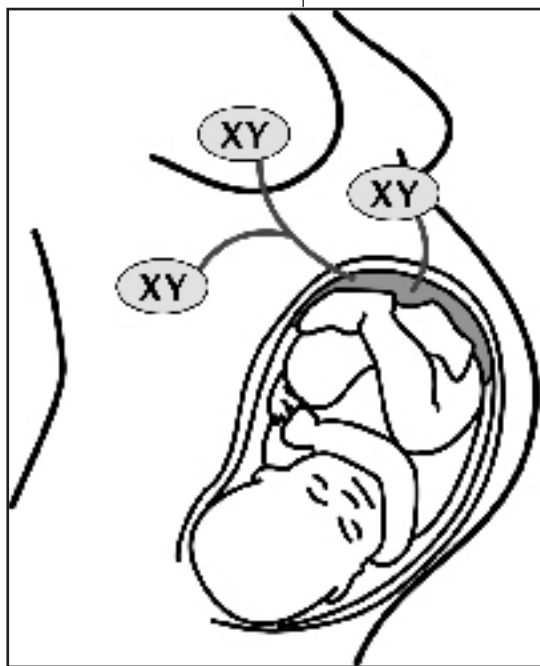
autoimmune disease results when the body’s immune system mistakenly attacks its own organs (7). By studying autoimmune diseases found mainly in middle-aged women, researchers discovered that women with autoimmune diseases exhibit increased microchimerism compared with controls (2).

However, the fact that fetal cells are found on tissues affected with non-autoimmune diseases caused researchers at Tufts-NEMC to look at these studies in a different light (5). They believe that the fetal cells are associated with damaged tissue because they are trying to repair the tissue: “Fetal cells thus probably do not trigger the disease but instead home to the affected maternal tissue if the damage reaches a particular ‘threshold’” (2).

Evidence that fetal cell microchimerism combats non-autoimmune diseases strengthens the argument that fetal cells are treating autoimmune diseases in women. In one case study, a woman who had prematurely stopped treatment for hepatitis C nonetheless experienced an unexpected recovery. A sample of tissue from her liver showed that it was covered with thousands of male cells. DNA analysis of the cells, along with the knowledge that she was not a twin and had never needed a blood transfusion, showed that the cells were probably from a fetus that she had terminated 17-19 years before (2).

Tufts-NEMC researchers studied fetal cells with markers associated with mature tissues. They found that fetal cells associated with diseased tissue had non-blood markers, whereas cells associated with healthy tissue had blood markers. This implies that fetal cells, like stem cells, can change and develop according to their surroundings (8).

In an interview, Dr. Diana Bianchi, Principal Investigator and Chief of Genetics at Floating Hospital for Children at Tufts-NEMC, expressed her hope that fetal cell microchimerism



▲ Fetal cells migrate to maternal tissue and blood through the placenta. This can be detected, for example, by the presence of XY cells in a mother who has carried a male fetus.

will advance stem cell research while avoiding ethical concerns about the origin of stem cell lines (8). While Dr. Bianchi believes that PAPCs might not be as unspecialized as embryonic stem cells derived from human embryos, she hopes that the ability of PAPCs to differentiate into more specialized tissues, such as thyroid tissue, will make them a potential source of cells for therapy (9). **H**

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2. Bianchi, D. W. and Khosrotehrani, K. (2005). "Multi-lineage potential of fetal cells in maternal tissue: a legacy in reverse." *Journal of Cell Science* 118, 1559-1563.
3. "Graft-versus-host disease." *Cancerbackup*. <<http://www.cancerbackup.org.uk/Treatments/Stemcellbonemarrowtransplants/Generalinformation/Graftversushostdisease>>.
4. "Diseases and Conditions." *AllRefer Health - Medical Encyclopedia*. <<http://health.allrefer.com/health/transplant-rejection-info.html>>.
5. Khosrotehrani, K., Johnson, K. L., Cha, D. H., Salomon, R. N. and Bianchi, D. W. (2004a). "Transfer of fetal cells with multi-lineage potential to maternal tissue." *JAMA* 292, 75-80.
6. Stem Cell Basics." *National Institutes of Health*. <<http://stemcells.nih.gov/info/basics>>.
7. "Autoimmune Disease in Women - The Facts." *American Autoimmune Related Diseases Association, Inc.* <<http://www.aarda.org/women.html>>.
8. "Children Give Back to Mothers." *Tufts-New England Medical Center*. <<http://www.nemc.org/home/news/press-rel/2004/04070604.htm>>.
9. Phone interview with Dr. Diana Bianchi, 10/26/06.

The Technozoic Era

By Susan De Wolf

"Will you google that for me?" "Did you text her yet?" Twenty years ago, these questions would have sounded like gibberish, but today, these very phrases are unavoidable in everyday speech. New words are perpetually making their way into any language, often as terms borrowed from another region or culture. In contrast, the words that entered English in the past 20 years have a strikingly different source: innovations in the fields of science. Indeed, the English language is under constant strain to keep up with the technology that has transformed the world we inhabit.

It's official. If you look up "to Google" in the Oxford English Dictionary (OED), you'll find a complete entry: "to use the Google search engine to find information on the internet (intransitive)" or "to search for information about (a person or thing) using the Google search engine (transitive) (1)." Although it is the second entry for the verb, behind "to google" the ball in cricket, defined as "to have a 'googly' break and swerve," "to Google" is a real word, and it took no time at all to earn that status. The addictive Internet search engine was launched in September 1998 (its name a modified form of the noun googol, a non-technical term for ten raised to the hundredth

power, alluding to the plethora of information available on the internet), and by 1999, "to Google" was legitimate. On October 10th of that year, in a Usenet group, the OED reports the quotation, "Has anyone Googled? www.google.com Ver ver [sic] clean and fast (1)." And in 2001, the New York Times published an article on March 11th with the sentence, "I met this woman last night at a party and I came right home and Googled her (1)." Who would have ever guessed?

What is it that made Americans so ready to adopt this word into their vernacular? Why does "google" sound right? Linguistically, "to google" sounds like an English verb. The phonetics of google not only seem familiar to a native English speaker--a consonant and long vowel followed by the 'gle' ending (as in beagle) adhering to a conventional structure--but the word google already existed as a formal surname, appearing in the New York Times as early as 1854 (2).

To commemorate the 20th anniversary of the Harvard Science Review, here is a list of twenty new words that have entered the English language in the past 20 years, driven by unparalleled developments in science and technology:

e-mail, <i>n.</i> 1987(3) text message, <i>v.</i> 1994	Perhaps the most significant transformation of the past 20 years has been in the way Americans communicate. A whole new set of words have appeared not only to name those methods, but also to describe the use of the new tools. The noun e-mail entered the OED in 1982, but English-speakers quickly found the need to turn the noun into the verb, which appeared in the OED by 1987.
website, <i>n.</i> 1993	With the invention of the internet came a whole new internet terminology, and even some of those words have evolved since their recent addition to the language. When weblog first appeared in the OED in 1993, its definition was "A file storing a detailed record of requests handled (and sometimes also errors generated) by a web server," but already the meaning has shifted with the popularity of the personal journals or blogs on the internet.
dotcom, <i>n.</i> 1994	
weblog, <i>n.</i> 1997	
piconet, <i>n.</i> 1997	
Wi-Fi, <i>n.</i> 1999	
cyber, <i>a.</i> 1992	Not only were new words necessary to name the new parts of the internet like website and weblog, but terms appeared to keep up with the <i>cyber</i> culture.
hacktivism, <i>n.</i> 1998	
spam, <i>v.</i> 1991	
Google, <i>v.</i> 1999	
geocaching, <i>n.</i> 2000	
phishing, <i>n.</i> 1996	
MP3, <i>n.</i> 1996	The internet is not the only technological advance of the past two decades, and there are a plethora of new words to reflect new discoveries.
OLED, <i>n.</i> 1996	
Nano, <i>n.</i> 1987	
non-nucleoside, <i>a.</i> and <i>n.</i> 1987	Advances in the biological sciences have also made an impact on the English language. There are influences from new fields of studies, particularly that of genetics, and from improvements in the treatment of disease, such as from the struggle against the AIDS epidemic.
proteome, <i>n.</i> 1995	
Mathlete, <i>n.</i> 2001	
Facebook, <i>n.</i>	Harvard too has had its impact on the English lexicon. Facebook may not yet have officially entered the OED, but its incredible popularity suggests it is only a matter of time.
Friend <i>v.</i>	

While languages will always change with the people who speak them, over the past 20 years, science and technology have created a myriad of new niches in which English can explore, adapt, and thrive; whether it be a novel nomenclature for the taxonomy of archeobacteria, a radical theory for the organization of the universe, the developing field of biofuels and energy technologies, a newly identified protein, or an emerging area of study like protenomics or glycobiology, English has carved out its fair share of novel terminologies. Sure, some seemingly random words do emerge—nouns like road rage, *n.* (1988) and macchiato, *n.* (1989), words coined for political movement or economic campaigns such as feminazi, *n.* (1990)

Clintonomics, *n.* (1992), and even J.K. Rowling's invention, the "Muggle," *n.* (1997)—but the most significant evolutionary force is indisputably the new age of science, medicine, and technology. Perhaps, English is ready to leave the Cenozoic period of language; maybe it's time to venture into the wireless, digital, genetically engineered age of the Technozoic Era. **H**

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1: "Google." *Oxford English Dictionary*, 2006.
2: "Frightful Explosion of a Boiler in Cincinnati." *New York Daily Times* (1851-1837); Jun 17, 1854; ProQuest Historical Newspapers The New York Times (1851-2003) pg. 3.
3: "E-mail." *Oxford English Dictionary*, 2006.