

STEM CELLS IN THE MEDIA: THE EMERGENCE OF PUBLIC UNDERSTANDING OF A NEW TECHNOLOGY

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Summary

The failure of the introduction to Europe of GM foods illustrates how negative public perception of a novel technology can block the development of new products and services in spite of major corporate and governmental investment. Stem cell technology is a novel technology which holds out the promise of improved treatments for many major diseases. However stem cell research is a highly controversial area of life science. This is mainly due to the use of human embryos, which are one of the sources of stem cells. This has created barriers to the technology in many countries. (Cheshire, 2004; Nisbet, 2004; Knowles, 2004) but not, thus far, in the United Kingdom (UK), which has been at the forefront of the research with many scientific breakthroughs in the field of stem cells and cloning (Pfeifer, 2005; Sample, 2005).

This paper analyses media coverage of stem cells in the USA and the UK as an indicator of how, over a period of time, specific events may impact on the public discussion of a new technology and may ultimately affect public perceptions. The period covered in this study, from 1 May 2004 to 30 April 2005, was selected because it coincided with the run-up to the US Presidential Election where stem cells became an election issue (Hanson, 2004; Primack, 2004; Fox, 2004). The study found that the media during this period were focusing on economic opportunity and prospect rather than ethical issues associated with stem cell research. This differed considerably from the emphasis of media discussion of genetically modified (GM) foods during the previous decade which was associated with public unease and widespread concern particularly in Europe (Martin & Tait, 1992; Krinsky, 1998; Miller, 1999; Tait, 1999; Bower, 2005)

INTRODUCTION

Public concerns about the perceived risks associated with some technologies have had a significant impact on the commercial feasibility of these technologies. This has affected technologies as diverse as nuclear power and GM crops (discussed below). Stem cell technology is a recent addition to the list of controversial technologies which arouse public interest and media coverage.

Stem cells are unspecialised cells found in very small quantities in most living tissues which have the ability to self renew indefinitely and differentiate into mature cells with specialised functions (NIH, 2003; DoH, 2003; NRC, 2002). Although there are very considerable unresolved technical problems (Nature Biotechnology, 2005) scientists have identified major healthcare areas in which stem cells are likely to hold significant therapeutic potential: (1) degenerative diseases such as Parkinson's, Alzheimer, stroke, heart disease, diabetes and arthritis (NIH, 2001; NRC 2002; Petersen and Terada, 2001; Keller and Snodgrass, 1999); (2) therapeutic applications in cell based therapies for spinal cord and other structural injuries, cancer, etc; and (3) drug discovery procedures to test the effectiveness and safety of drugs (Dayley et al, 2003; NRC, 2002; NIH, 2001; Keller, Snodgrass, 1999).

In spite of this great potential, stem cell research has always been surrounded in controversy leading to considerable discussion and ethical debate on permitting such research while preserving respect for human life (Cheshire, 2004; Nisbet, 2004; Knowles, 2004). Briefly, this is because the stem cell lines which are generally regarded as having most therapeutic potential are derived from human embryos. The stem cell debate is mainly focused on

whether embryo-derived cells should ever be used for therapy. The ethical justification of using embryonic stem cells derived from: (1) left over frozen embryos from in-vitro fertilisation (IVF) treatment; (2) embryos created for research purposes; and (3) therapeutic cloning; is often dismissed by opponents on one or both of the following grounds: 1. There are alternative techniques such as using adult stem cell from human somatic tissues or umbilical cord blood (NIH, 2001; Petersen and Terada, 2001). 2. It is unethical to use tissues derived through the destruction of human embryos even for therapeutic purposes (Cheshire, 2004; Nisbet, 2004; Knowles, 2004; Matthiessen-Guyader and Joliff-Bottrel, 2002). Proponents of embryonic stem cell justify their use as offering the best possible hope for patients (NIH, 2001; Vogel, 2001). In fact the focus on embryonic and not adult stem cell among scientific fraternity is because of the problem of using adult stem cells:

“...difficult to maintain them in undifferentiated state when grown in culture; they are rare and difficult to identify and purify” (NRC, 2002).

This has created a dilemma. On the one hand there are complex ethical, moral and social issues to be addressed:

“the moral status of embryos; the ethical conflict between using ‘spare embryos’ (embryos created for infertility treatment to enhance the success rate of in-vitro fertilisation (IVF) but no longer needed for this purpose); altruistic versus rewarded donations of gametes or embryos; patenting of human stem cells; and commercialisation of human stem cells”. (Matthiessen-Guyader and Joliff-Bottrel, 2002)

On the other there is the therapeutic and economic potential of embryonic stem cells. If they give rise to effective therapies, companies which develop them could reap the financial benefits associated with successful drugs, if the therapies are appropriable. Countries stand to reap the economic benefits of both successful companies and improved healthcare.

This summarises very briefly the controversy surrounding stem cell research. At the date of writing (March 2006) it has not been resolved, with different public groups taking different positions as to the permissibility of supporting human stem cell research, within and between countries (Knowles, 2004). In 2001 President Bush had severely limited the use of Federal funds for stem cell research on ethical grounds (Nature Biotechnology, 2001) a position which is unchanged today. The UK Government, on the other hand, has consistently taken a very positive view (Knowles, 2004).

GM Foods

This issue of public acceptability became particularly problematic in the case of GM Foods, where popular concerns created major hurdles, particularly in Europe (reviewed, Krimsky, 1999). Polls had shown that public doubts about GM foods were widespread among the European public well before field trials were carried out (Martin and Tait, 1992). When this stage was reached, action groups destroyed fields of trial crops (Fox, 1999). EU countries threatened to close their markets to GM foods (Financial Times, 1999). A controversial study which concluded that GM foods threatened the survival of the Monarch butterfly, an American icon, reawakened American concerns which had been quiet since the 1980s (Fox, 1999). One of the biggest US agri-trading businesses asked growers to segregate GM and

non-GM crops, which led to a great increase in costs (Tait, 1999). This led to loss of investor interest in this area of application. Small firms failed – Axis Genetics which used plants to produce human vaccine components, failed in September 1999 to raise £10m which was urgently required, and put itself up for sale (Fox, 1999). Large firms in the sector experienced falls in their share prices, and in some cases divested the parts of their business associated with GM foods. The company Syngenta (www.syngenta.com) came into existence in this way, divested by Swiss multinational Roche.

Both the processes by which the changes were made, and the products themselves, led to feelings of unease in some quarters (Barnes, 1999; Webster, 2002; Bower, 2005). This affected their acceptability and hence became another source of risk. There could only be an adequate return on the high levels of investment required for these developments from products which were approved and widely accepted in wealthy societies.

This risk also faces other novel technologies if an unfavourable discourse develops among public groups.

Economic issues

Biotechnology and pharmaceutical companies face high costs and risks to develop new therapies (Di Masi et al, 2003). The bursting of the IT ‘bubble economy’ in 2000 was the end of massive speculative investment in high technology companies, at least for a time (Klausner, 2005). Investors are currently more cautious and wary of claims of the potential for high return on technology investments. The combination of technical and ethical uncertainties associated with stem cell commercialisation, along with regulatory and legal difficulties, pose a formidable barrier to private investment in stem cell research at this time. Consequently there is a very limited availability of private finance to develop the technology.

However, thanks to the perceived economic benefits there have been some public initiatives, aimed at taking the technology forward to the point at which private investors would be willing to invest the substantial amounts required to take applications into routine therapeutic use. Singapore has committed massive public expenditure on biomedical science in general through government led initiatives : the National Biomedical Science Strategy, in which an estimated \$2 billion is set aside over the next five years (Normile, 2002) specifically including stem cell research. Other countries have since developed their own initiatives. The United Kingdom is one of these countries as highlighted by Dorsey (2005):

“In contrast to the US - where federal funding for stem cell research has been curtailed by pro-life concerns - Gordon Brown said that he would make this a keystone in building the UK's knowledge economy”.

Regulations, policy and government led initiatives such as the UK Stem Cell Bank (www.ukstemcellbank.org.uk/), UK Stem Cell Initiatives (www.advisorybodies.doh.gov.uk/uksci/) (e.g. UK Stem Cell Foundation (www.ukscf.org/)) as well as regional government initiatives such as the Scottish Stem Cell Network (www.sscn.co.uk) and East of England Stem Cell Network (www.eescn.org.uk) coupled with a £2.5 billion government allocation for biotechnology until 2008 which include stem cell research reflect this desire to become global leader in research, science and knowledge based industries.

In spite of the lack of central government support in the USA, State governments in the USA are creating their own support mechanisms for stem cell research. For example California's \$3 billion initiative where public funds are being made available exclusively for promoting and supporting stem cell research in the state through the California Institute for Regenerative Medicine (CIRM) over next 10 years, equating to \$300 million a year (Check, 2005). The fear of losing scientists to other states has seen others taking immediate action countering this. States in the US such as Connecticut, Massachusetts and New Jersey are passing or have passed laws allowing them to fund stem cell research (Reinberg, 2005; Oransky, 2004). Other countries too have realised the economic importance of stem cell research. Australia, China, Japan, Sweden and South Korea are among the countries that have committed federal funds and developed national initiatives in stem cell research (Du, 2005; Jia, 2004; De Trizio and Brennan, 2004; Sleeboom, 2002).

The level of governmental support into stem cell research is an indicator of the importance placed on the potential of stem cells as an economic generator. But it remains to be seen whether the public in all these jurisdictions will be willing to support research which is perceived by some to compromise the 'respect for human life' especially when it may be years from clinical application.

Focus of the study

It is not proposed in this paper to explore further either the technical or ethical issues surrounding stem cell technology. This study focuses on the emerging public understanding of the significance of stem cell technology in the UK and the USA. It analyses the US and UK media coverage of this area in the year following April 2004, as a reflection of public perceptions of this new and controversial technology and its potential for society.

BACKGROUND

Role of the media

It has been argued that media has always played an important role in the advancement of technologies. According to Turney (1998), scientists :

“...began trying harder to influence or control the public image of science in the media outside their own hands – attempts which have gone on ever since”.

One model of policy making described the media's role in the policy process as that of a key disseminator of scientific information (Lomas, 2000). This model described how information is generated by researchers and then disseminated by advocacy networks and the media. It is then picked up by individuals formally involved in the policy process, such as government officials and those informally involved such as citizens and stakeholder groups. However, Lomas (2004) further stated that:

“It is these purveyors who turn information into common knowledge”.

This explains the role the media have in disseminating information, particularly scientific information, to the public. Another view of the media is that of Christensen (2004: 26), where his study described the media as:

“...*de facto* extensions of the state-corporate-military complex and their function is to (directly or indirectly) smooth the way for US commerce and government policy”.

This is why the media are considered an important tool in dissemination of information. However, the interpretation of this information is influenced by the value systems of the individuals receiving the information (Wilson et al, 2004). For example, acceptance increases if the research is linked to potential therapeutic applications which confirms the suggestive power of expectations of cures and therapies (Pompe et al, 2005).

Media reporting cannot be given all the responsibility for influencing public acceptance.. The public too can influence the way news is reported and presented in the media. Newspapers are in the business of selling news and as such their reporting of news must meet their readership’s expectations and interest, which is part of the explanation for selective reporting. The media cannot force people to read newspapers if they do not wish to. This is reflected in the current climate of declining newspaper readership leading to content revising, changes to the layout and creating special supplements targeted at the readership (Raeymaeckers, 2004).

Cultural and historical events influence news reporting in the media (Molina, 2004). In the 1960’s, scientific and technological ‘breakthroughs’ and ‘revolution’ were all the rage in news reporting but this changed in the 1970s to concerns about ‘risks’. In the 1980s, the enthusiasm of the 1960s re-emerged and the old clichés about ‘breakthroughs’ re-emerged (Nisbet and Lewenstein, 2001; Nelkin, 1995). The media again underwent another phase in its news reporting where:

“...coverage shifted from a heavy positive emphasis on economic prospect and progress in 1995 and 1996, to an increase in discussion of ethics, public accountability and controversy in 1997, 1998 and 1999” (Nisbet and Lewenstein, 2001: 2).

However one looks at it, journalism plays an important role because:

“..it can reinforce the authority of science in society [by providing] scientists with unique opportunities to defend and augment their authoritative position in society” (Zehr, 1999).

Valiverronen (2004) noted that biotechnology regularly attracts media interest:

“... modern biotechnology meets most of the criteria for a good news story.”

The public interest generated by stem cells has been registered and possibly influenced through media coverage. The situation may be compared with the media strategies, representation and audience reception of the AIDS crisis studied by Miller, Kitzinger and Williams (1998) where they found that:

“... media has proven to be an effective lobbying arena where public policy is defined and played out”.

This can be seen in current media interest in stem cell research. Much of the coverage is favourable, in the category which Mulkay (1993) described as a ‘rhetoric of hope’, portraying an optimistic view of science as progressive and offering future benefits to health and society. It has been credited with the potential to transform lives fundamentally, carrying great health and economic promise. However this promise is accompanied by the suggestion of potential danger (Valiverronen, 2004). The perception of potential for danger echoes Mulkay’s alternative view of science, the ‘rhetoric of fear’ (1993):

“A pessimistic view of science the public has towards embryo research where ‘mad scientists’ are ‘out of control’, morality is declining and social disintegration threatens”. (Bower, 2005)

It is this “rhetoric of fear” that had a profound effect on the GM debate. The negative view presented in the media by anti GM activists created a sense of fear within the public:

“The discourse was dominated by the ‘rhetoric of fear’ demonising the technology.” (Bower, 2005).

The ability to influence and inform the public is an important attribute of the media. Studies have shown that knowledge of scientific, ethical and legislative aspects of stem cell research is correlated with media coverage (Nisbet, 2004). It has also been suggested that media coverage of stem cells influences public opinion and impacts on the way we think (Petersen, 2002; Kitlinger, 2000; Condit, 1999). For example, amid the coverage of President Bush’s restrictions on federally funded stem cell research in August 2001, 60% of US citizens felt they were well informed about the topic. That figure however, dropped to 28% within a few weeks and a further 17% a year later (Nisbet, 2004). The steady decrease was correlated with the declining media coverage of Bush’s stem cell stance.

METHODOLOGY

This raises the question of what press coverage since 2000 indicates about the evolving public perception of stem cell technology in the USA and the UK, and whether there have been critical events which have impacted on the rhetoric. The objectives of this paper were :

1. to identify US and UK newspaper articles featuring stem cells in the headlines,
2. to categorise the articles by the nature of their coverage.
3. to identify key events within the period April 2004-5 which may have impacted on public perception of stem cells.

As discussed earlier in this paper, the analysis of news reports of stem cell research gives an indication of readers’ opinions. While media content is not a direct indicator of public opinion, it does reflect and therefore can reveal deep seated cultural values (Gan, 1980). This proposition is adopted in the analysis employed in this study.

The selected newspaper and articles

The newspaper articles were obtained from eight major newspapers in the UK and US: (1) The Daily Telegraph; (2) The Guardian; (3) The Independent; (4) The Times; (5) USA Today; (6) The New York Times; (7) The Wall Street Journal; and (8) The Washington Post.

All newspapers selected included their Sunday equivalent. These newspapers were selected based on having these criteria: (1) national distribution (UK only); (2) large circulation figure; and (3) middle class/professional readership. The circulation figures were obtained from Audit Bureau of Circulations (www.abc.org.uk; www.accessabc.com) which is shown in Table 1.

Newspaper	Circulation Figure (approximate average figure)
The Daily Telegraph	1,545,595
The Guardian	754,876
The Independent	395,142
The Times	2,011,936
The New York Times	1,680,582
USA Today	2,612,946
The Wall Street Journal	2,070,498
The Washington Post	1,000,565

Table 1: Circulation figures of selected newspapers (Source: Audit Bureau of Circulation as at 31 March 2005)

The readership data was obtained from National Readership Survey (NRS; www.nrs.co.uk) and Audit Bureau of Circulation (www.accessabc.com). Demographic of the readership in UK and US is illustrated in Figure 1 and Table 2 respectively.

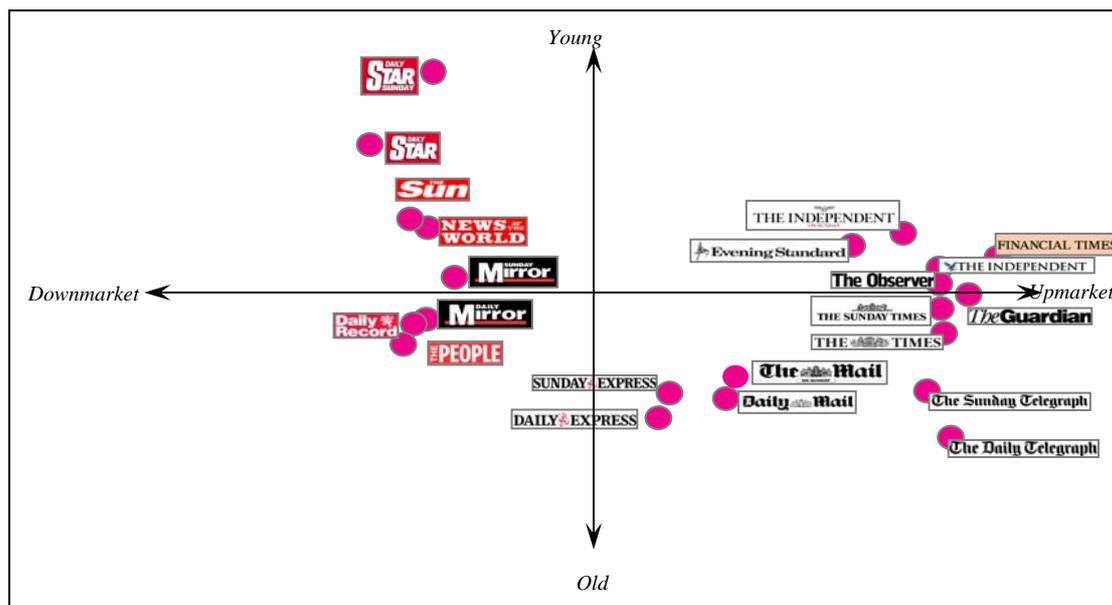


Figure 1: UK Newspaper Readership Demographic (Source: National Readership Survey January 2004 to December 2004)

Publication	Readership Demographic
The New York Times	Professional, service, sales, office
USA Today	Business, management, financial, professional, construction, maintenance, production, transportation
The Wall Street Journal	Business, management, financial, professional
The Washington Post	Business, management, financial, professional

Table 2: USA Newspaper Readership Demographic (Source: Audit Bureau of Circulation, March 2005)

The level of education and social status influences newspaper readership as the work of Chan and Goldthorpe (2005: 46) found:

“..education does indeed influence newspaper readership and on lines that would be predicted under the information-processing hypothesis, controlling for education does not remove the effects of status”.

The articles were then identified using search facility of: (1) Lexis Nexis Professional; and (2) the respective US newspaper online archives. Key phrase used in the search was ‘stem cell’ and the search was limited to return only results containing ‘stem cell’ in the headline of all newspaper articles. Every effort was made to ensure that all articles with stem cell in the headline were included. The results were checked to ensure no repeat stories (same articles with different spelling of stem cell such as stem cell, stem cells, stemcell, stemcells, stem-cell, and stem-cells). A total of 273 articles with stem cell in the headline were obtained; 86 from UK newspaper and 187 from USA newspaper. Letters to the editors were also included in the sample as this represented an interaction process between the public and the respective newspapers. The articles obtained were then categorised into categories reflecting their subject areas. Decisions about categories were made after reading the whole article. A judgment was made on the basis of the narrative as a whole as to the category into which it fitted. Where there was some overlap in terms of coverage between more than one category, the dominant category was selected.

Categories

The articles were then categorised into subject areas:

1. **Economic** referred to news reports on public and private investment; funding; job creation and unemployment; labour movement; intellectual property (IP) ownership; and economic generation (or regeneration).
2. **Ethics** referred to articles covering public concern about stem cell research; government and international ethics initiatives; ethical consideration of the research; and discourse or ethical debate on stem cells.
3. **Letters to Editors** referred to the letters sent to newspapers and these were taken to be indicators of the level of interest or response from the public in stem cells.
4. **People** referred to news reports concerning public figures (non-scientists) prominently featured in relation to the field of stem cell research. This included people who were either for or against the research.
5. **Politics and Policy** referred to news reports covering policy and guidelines; also politics and elections (such as the US Presidential Election and UK General Election).
6. **Science** covered scientific and technological breakthroughs and achievement in stem cell research; also scientific issues affecting the development of the research.

Period of study and events

The period covered by the search was from 1 May 2004 to 30 April 2005 during which there were many significant developments in areas concerning stem cell research particularly political events, scientific advancement, ethical issues and economic matters. These events

are discussed further in the next section highlighting events that might have had an impact on news reporting.

Methodological limitations

One limitation was the possible subjectivity of the researchers in categorising the articles. Another methodological problem was that headlines only were used to identify news reports. The actual number of articles with ‘stem cell’ in the main body of the articles might be more than that gathered. The choice of newspapers in this study raises another issue. The criteria used for the selection was based on NRS for UK and the ABC for USA. The NRS claim to be:

“... a non-profit-making but commercial organisation which sets out to provide estimates of the number and nature of the people who read Britain’s newspapers and consumer magazines. Currently the Survey publishes data covering some 250 newspapers, newspaper supplements and magazines” (Source: www.nrs.co.uk).

Their methodology and survey technique of the readership is open to interpretation. Other limitations are the ownership and political affiliation of a selected newspaper which have considerable influence on the news it reports. This view is shared by Herman and Chomsky (1988), Altschull (1995), Bogart (1995) and Parenti (1993) who viewed media size, corporate ownership and advertising as the most important factors in shaping news output. This was minimised by selecting several journals which held well-known, differing political stances. A final point is that the Letters to Editors, whose publication is under editorial control, might not be representative of the actual number of responses from the public.

RESULTS

273 newspaper articles were examined with US newspapers producing 187 and UK newspapers 86. Figure 2 shows the total number of articles published by each paper over the period studied.

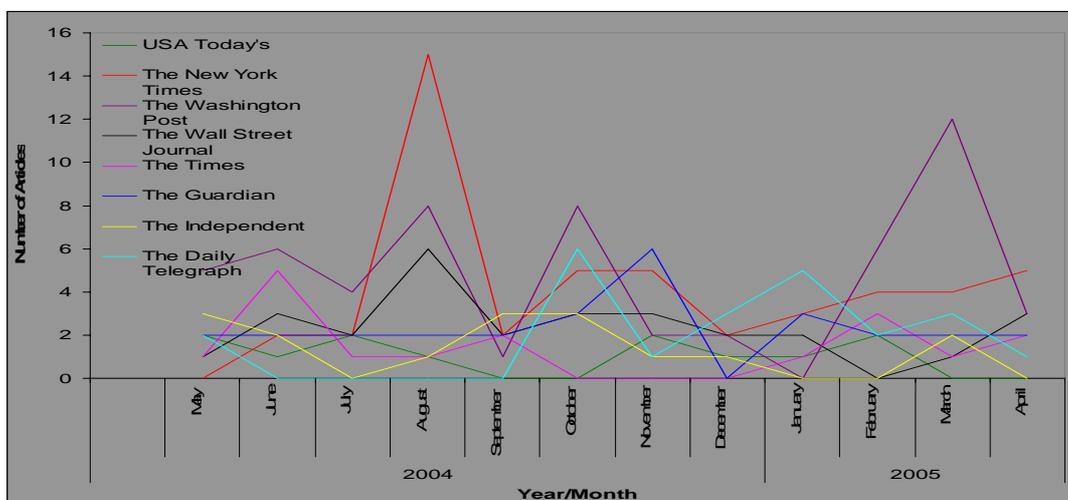


Figure 2 : Numbers of stem cell headlined articles published in the UK and US named newspapers between 1 May 2004 and 30 April 2005

As Christensen (2004) has concluded :

“... the number of articles only tell one side of the story while the other is to be found in the analysis of the emphasis placed on certain stories vis-à-vis others”.

Table 3 shows the number of articles in each of the categories identified in each of the US and UK papers.

Publication	Economics	Ethics	Letters to the Editor	People	Politics & Policy	Science	Total Number of Articles
The Daily Telegraph and Sunday Telegraph	4	3	0	2	4	11	24
The Guardian and The Observer	5	0	1	2	5	14	27
The Independent and The Independent on Sunday	2	1	0	2	5	6	16
The Times and The Sunday Times	2	0	1	1	5	10	19
The New York Times	13	3	24	3	22	5	70
The Wall Street Journal	2	3	2	0	14	10	31
The Washington Post	3	1	0	3	43	13	63
USA Today	5	7	0	2	8	1	23
Total	36	18	28	15	106	70	273

Table 3: Categories and numbers of articles published in UK and USA newspapers

The category with the most articles published in both UK and US newspapers is **Politics and Policy** with 106 articles (19 in UK and 87 in USA). This is followed by **Science** with 70 articles; **Economics** with 36 articles; **Letters to Editors** with 28; **Ethics** with 18 and **People** with 15 articles.

Events shaping the news

A number of events occurred during the period of study which were linked in the articles to stem cell technology. These are described, with date of occurrence, in Table 4. In some cases these were events whose outcomes would facilitate the technical developments. However, events which triggered public discussion also have the potential to influence the development of the public debate about stem cell technology. The launch of the UK Stem Cell Bank in May 2004 was the first stem cell bank in the world offering scientists the ability to:

“...provide a repository for human stem cell lines of all types, and will be developed to supply well characterised cell lines under appropriate and accredited quality

systems both for basic research and for the development of clinical applications”
 (Source: UK Stem Cell Bank website www.ukstemcellbank.org.uk).

Date	Events
May 2004	First Stem Cell bank launched in UK and 2 stem cell lines created in the UK were the first to be deposited.
	New Jersey became first state in the US to support stem cell research through its Stem Cell Institute of New Jersey with initial public fund of \$6.5 million and \$20 million of private funding.
5 June 2004	Former US President, Ronald Reagan dies.
August 2004	Scientists at Newcastle University’s Centre for Life granted first UK cloning licence to create human embryonic stem cells.
10 October 2004	Christopher Reeves dies.
November 2004	US Presidential Election.
	Californians voted for Proposition 71 allowing stem cell research to be conducted and raising of £3 billion over 10 years to fund the research.
20 January 2005	George W. Bush takes the oath of office.
February 2005	HFEA granted therapeutic cloning license to study motor neuron disease to Roslin Institute.
	UK Stem Cell Foundation supported by the Prime Minister with £100 million funding was proposed by Prof. Sir Christopher Evans.
16 March 2005	UK 2005 Budget announced with new initiatives (e.g. UK Stem Cell Initiatives) to boost science and innovation with stem cell taking centre stage.

Table 4: Heavily reported events within the period of study

In May 2004 New Jersey became the first US state supporting stem cells through its Stem Cell Institute of New Jersey with \$6.5 million public funds and a further \$20 million private funding for stem cell research. This paled in comparison with the California initiative passed by public vote in November where \$3 billion of public funds were committed over ten years for stem cell developments. These initiatives signify the frustration of scientists and States with Bush’s stance against stem cell research. This frustration was also borne out during the US Presidential Election where the newspaper reports indicate that stem cell research became an election issue. The death of former US President, Ronald Reagan, and the actor Christopher Reeves in June and October respectively, contributed to the call for federal support for stem cell research in USA.

Newspaper reports document the granting of the UK’s first therapeutic cloning licence to scientists at Newcastle University’s Centre for Life in August 2004 as well as another licence to Roslin Institute in February. The awarding of both licences highlighted the importance the UK was placing on stem cell research.

These events had an impact on the number and content of articles in newspapers. Four significant peaks are visible in Figure 2. The first peak occurs in June 2004, followed by a second peak starting in July 2004 and reaching its maximum in August 2004. This is followed by a third in October and the final peak occurring between January 2005 and March 2005.

The first peak corresponds to reports of the death of former US President, Ronald Reagan. Stem cells received wide coverage in these reports due to his death from Alzheimers and because his wife was a key proponent of stem cell research among the Republican in US. The second peak corresponds to reports of the death of another prominent proponent of stem cell research, the actor Christopher Reeves. The US Presidential Election in November was the

main contributor to the increase in articles in the third peak while the final peak was mainly due to two events: (1) the interest generated with tabling of stem cell bills in Maryland, Massachusetts and New Jersey State Assembly; and (2) in the UK newspapers, the tabling of UK Budget.

Three US newspapers (The New York Times, The Wall Street Journal, and The Washington Post) showed significant peaks in August, mainly due to the support of Bush's stem cell policy by Laura Bush. There was a large increase in the number of **Letters to the Editor** in The New York Times commenting on this news. The Presidential Election caused the increase in all newspapers in the period from October to November. Another significant contributor to the increase in this period was the Californian Proposition 71 and also the granting of the first UK cloning licence to Newcastle University.

The final increase can be attributed to the coverage of another cloning licence awarded to the Roslin Institute, and to UK government support for stem cells which included £100m funding being made available in the UK budget in March 2005.

DISCUSSION

The numbers generated in this study are not large enough for rigorous statistical analysis. However they do give some indication as to the associations being made by the media in relation to stem cells, and their relative importance, in the USA and the UK.

One event influenced news reporting relating to stem cells more than others both in the UK and the USA: the US Presidential Election. However, there were clear differences between the US and the UK reporting of both Politics and Economics which indicated that the categories had rather different scope in the two countries. The UK press revealed a fairly even view of stem cells as an area of economic interest, generally supported by politicians of all parties. The perceived economic opportunity presented to the UK by the Bush policy, which could allow the technology to advance in the more permissive climate of the UK while it was impeded in the USA, was evident in UK newspapers reporting of stem cell research. This raises an interesting point that suggests stem cell research is overwhelmingly seen in the same light by all major political parties in the UK, and presumably then by most of the public: as offering a clear economic prospect and potential to cure diseases. For this reason, and in contrast to the US Presidential Election, the run-up to the UK General Election did not offer the same level of political debate on stem cell research. The unveiling of the UK 2005 Budget with a clear focus on making stem cells a contributor to the UK economy was never challenged by the party in opposition.

The US reporting of the US Presidential Election focused on the conservatism of the Bush administration. Bush's policy on stem cell research caused considerable conflict between political parties. Interestingly it even met with some opposition within his own Republican Party. This opposition was reported in all the articles in the **People** category of this study. Most articles commented on proponents of stem cell research such as Nancy Reagan, Michael J. Fox, Christopher Reeves and Arnold Schwarzenegger with a couple of articles on opponents of stem cell research, in particular Barbara Bush.

Bush's position was viewed by scientists as stifling the development of stem cell research in USA. The anxiety caused by his conservatism on stem cells resulted in individual states in the

US developing their own initiative for stem cell research. More states in the US are now actively seeking to table bills allowing them to undertake their own stem cell initiatives which they see as a necessity to counter the impact of California Proposition 71. As one article stated:

“At the very least, competing States are trying to keep their own researchers from migration to the West Coast. (Mansnerus, 2005).

Not only was stem cell technology regarded as an economic prospect but it was also seen as a pre-emptive strategy to prevent the loss of highly skilled labour.

The most interesting development identified by this study was the low level of discussion of ethical issues (except indirectly, inasmuch as the Bush position was taken on ethical grounds) in both UK and US newspapers. The fact that there were only eighteen articles (four in UK and fourteen in US newspapers) directly concerned with ethics out of a total of 273 suggests that the media interest was mainly focused on the economic and health outcomes of the research. As discussed above, the media position is likely to reflect public views. Hence this suggests that there was widespread public acceptance in the USA of stem cell research as a desirable activity. Although the US official stance on stem cell research, which has been on political rather than purely ethical grounds (McGee, 1999) has been different from that of the UK, public attitudes do not appear to be as divergent.

The only category that was reported more in the UK than the US was **Science**. The focus on scientific news in UK newspapers may be attributed to the clear indication from UK government, in the words of UK Prime Minister, speaking about the 5 year plan of the Department of Trade and Industry, of the intention to:

“..become the world leader in stem cell research, biotechnology etc”.
(<http://www.number-10.gov.uk/output/Page6596.asp>)

This statement, associated with the award of funds for research, cell banks and regulatory approval of cloning research indicates the strength of UK government commitment to develop the technology.

CONCLUSIONS

Nisbet (2004); Petersen (2002); Kitzinger (2000); and Condit (1999) found that media coverage influences public opinion and impacts on the way people think. In the light of their conclusions, the results of this study suggest that the science and technology associated with stem cells are currently perceived by the UK public, and to a large degree by the US public, primarily as economically significant activities. The number of letters published in the wake of the deaths of both Ronald Reagan and Christopher Reeves gives an indication of the level of public interest in the therapeutic potential of stem cell research. It also illustrates how media coverage can be positively or negatively influenced by current events, which in turn impacts on public perceptions.

The perceptions reported here in relation to stem cell research differ markedly from the very negative UK public perception of GM crops reflected in media discussions during the previous decade (Martin & Tait, 1992; Krinsky, 1998; Miller, 1999; Tait, 1999; Bower,

2005). In this case public opinion became so hostile that it has proved impossible to deploy GM crop technology in the UK. At present it appears that a favourable rhetoric has developed around stem cells in the UK, and to a large extent in the USA, even though the current US government has put barriers in the path of development. However, public attitudes can change. It cannot be concluded that the opposition to the technology may increase. For example, if clinical trials showed adverse effects outweighing clinical benefits the current positive perceptions might wane.

The high number of **Science** related articles may be a sign of a change in public mood towards a higher level of expectation of benefits from technology than has recently been the case, particularly in the UK. The media may be starting to focus on science and technology 'breakthroughs' as they did in the 1960s. Nisbet and Lewenstein (2001) have discussed the enthusiasm for technology in the 1960s, and also a relative increase in media focus on the 'economic prospects and progress' of science and technology in 1995 and 1996. The evidence presented here also suggests that newspapers may be less preoccupied with risks, ethics, public accountability and controversy than they were in the period 1997 to 1999 (Nisbet and Lewenstein, 2001). If confirmed by further research this would indicate an interesting change in the trends of recent years.

Further research is planned to analyse the text discussed here in more depth utilising content analysis. The study will also be extended to include media coverage in continental Europe, Australia and Asia.

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