

**Cloning in the news:  
An analysis of how the science and ethics of cloning are  
reported in three daily newspapers of Cape Town**

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## Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature:

Date:

## Abstract

**Background:** Cloning is a topic that has long fascinated people. It has imbedded itself into popular culture, but studies show that the general public has, at best, only a vague understanding of what cloning entails. Alternatively, their perception has been skewed by that very same popular culture. However, cloning is a complex scientific subject that has considerable ethical implications. It is the kind of topic that people in a deliberate democracy should know about. The media play an important role in the education of the public with regards to science and technology. However, the media have the potential to do more than provide the basic facts. In fact, the media can play an important role in influencing the actions and opinions of the public. It is therefore a responsibility of the media to provide accurate information on scientific developments, such as cloning.

**Objective:** An analysis of three daily newspapers in the Western Cape was carried out to determine how cloning is reported. The broad topics addressed were whether the coverage focused on the ethical or scientific aspects of cloning, if the subject was reported in a positive or negative tone, and whether the science of cloning was adequately explained.

**Methodology:** A quantitative content analysis was completed of a sample of 69 articles. These articles were all those relating to cloning that appeared in three daily newspapers (*Cape Argus*, *Cape Times* and *Die Burger*) over a period of one year from 10 November 2002 to 10 November 2003.

**Findings:** Of all the articles analysed 34% focused on the scientific aspects, 21% focused on the ethical aspects, 6% focused on both ethics and science, while 39% focused on neither. Fifty two percent of articles dealing specifically with animal cloning focused on the science, while only 4% focused on the ethics. However, in articles dealing specifically with human cloning, more (30%) emphasised ethical aspects than scientific aspects (20%). With regards to tone of coverage, 32% of all the articles analysed were positive, 28% negative, and 40% neutral. Sixty percent of articles dealing specifically with animal cloning featured a positive tone, while only 13% of articles exclusively about human cloning had a positive tone. This 13% was comprised of articles on therapeutic rather than reproductive cloning. In terms of explaining the science associated with cloning, only 30% of articles provided an

explicit explanation. Potential threats to the accuracy of explaining science were found to exist.

**Conclusions:** While the overall findings were somewhat indistinct it seemed that when the media of the Western Cape reported on the cloning of animals it was done with a positive tone and emphasised the scientific aspects. Reporting on human cloning tended to feature a negative tone and emphasised the ethical aspects. The large number of 'neutral' results for both the 'tone' and 'science or ethics' variables could indicate that the media were wishing to remain neutral. However, the large number of neutral articles relating to the 'science or ethics' variable could have a negative impact on public understanding. The small number of articles explaining cloning and an emphasis on 'breakthrough' news stories could also have a negative impact on public understanding.

## Opsomming

**Agtergrond:** Kloning is 'n onderwerp wat die mensdom lank interesseer. Maar selfs al vorm kloning 'n deel van ons populêre kultuur, wys navorsing dat die groot publiek maar vaagweg verstaan wat die onderwerp behels. Dit is ook moontlik dat hul persepsie negatief beïnvloed is deur dieselfde populêre kultuur. Maar kloning is 'n komplekse wetenskaplike onderwerp met aansienlike etiese gevolgtrekkings. Dit is 'n onderwerp waarvan mense in 'n demokratiese samelewing moet weet. Die media speel 'n belangrike rol in die groot publiek se opleiding in wetenskap. Maar die media het die potensiaal om meer te doen as net die basiese feite deur te gee. Die media het die potensiaal om die gedrag en menings van die publiek te beïnvloed. Daarom is dit die verantwoordelikheid van die media om akkurate inligting oor wetenskaplike ontwikkelings, soos kloning, te voorsien.

**Dolewit:** Drie daaglikse koerante in die Weskaap is geanaliseer om te bepaal hoe kloning gedek word. Daar is bepaal of die artikels op die etiese of wetenskaplike aspekte van kloning fokus, of die onderwerp in 'n positiewe of negatiewe toon gedek is, en of die wetenskaplike aspekte doeltreffend verduidelik is.

**Metode:** 'n Kwantitatiewe inhoudsanalise van 69 artikels is voltooi. Die geanaliseerde artikels is al die oor kloning wat in drie daaglikse koerante (*Cape Argus*, *Cape Times* en *Die Burger*) tussen 10 November 2002 en 10 November 2003 verskyn het.

**Bevindinge:** Van die artikels het 34% net op die wetenskaplike aspekte van kloning gefokus, 21% net op die etiese aspekte, en 6% op beide etiek en wetenskap. Geen van dié twee aspekte is in 39% van artikels beklemtoon nie. Van die artikels wat spesifiek oor dierkloning geskryf is, het 52% op die wetenskaplike aspekte gefokus. Net 4% het op die etiese aspekte gefokus. In die geval van artikels oor die kloning van mense, het meer (30%) die etiese aspekte as die wetenskaplike aspekte (20%) beklemtoon. Met betrekking tot die toon, was 32% van al die artikels positief, 28% negatief, en 40% neutraal. In die geval van artikels uitsluitlik oor dierkloning het 60% 'n positiewe toon gedui, terwyl net 13% van artikels oor menslike kloning in 'n positiewe toon geskryf was. Dié 13% het bestaan uit artikels oor terapeutiese kloning. Geen artikels oor reprodktiewe kloning was met 'n positiewe toon geskryf nie.

Net 30% van artikels het 'n uitdruklike verduideliking van die geassosieerde wetenskap gegee. Daar is moontlike bedreigings tot die akkuraatheid van wetenskaplike verduidelikings gevind.

**Gevolgtrekkings:** Die algemene bevindinge is ietwat onduidelik maar dit blyk dat die daaglikse koerante van die Weskaap 'n positiewe toon in hul dekking van dierkloning gebruik het. Die wetenskaplike aspekte van dierkloning was in die artikels beklemtoon. Berigte oor menskloning was in 'n negatiewe toon geskryf en het die etiese aspekte daarvan beklemtoon. Die groot hoeveelheid 'neutraal' resultate vir die 'toon' en 'wetenskap of etiek' veranderlikes dui moontlik dat die media probeer het om neutraal te bly in hul dekking. Die groot hoeveelheid 'neutraal' artikels vir die 'wetenskap of etiek' veranderlike kan dalk 'n negatiewe invloed op publieke begrip van kloning hê. Die klein hoeveelheid artikels wat kloning verduidelik, en 'n klem op 'deurbraak' nuusstories kan ook dalk 'n negatiewe invloed op publieke begrip hê.

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## Chapter 1

### Introduction

“But events that alter our very notion of what it means to be human are few and scattered over the centuries. The birth of Dolly is one of them” (Kolata, 1998: 3).

The February 1997 announcement by scientists from the Roslin Institute in Scotland that they had succeeded in cloning a sheep from an adult cell resulted in widespread media coverage. “Worldwide the press reaction was of all possible hue: sober, thoughtful, pompous, portentous, shrill, frivolous, whimsical, and just plain daft – the full panoply of human response” (Wilmut, Campbell & Tudge, 2000: 245).

Media attention quickly shifted from the sheep’s birth to the ethical implications of cloning humans (Wilmut et al., 2000). Debates on cloning permeated the media and the general public, with the announcement triggering “intense interest in the science and ethics of cloning” amongst members of the public (Wellcome Trust).

But the public’s fascination with cloning has been longstanding.

“In 1972, when Willard Gaylin, a psychiatrist and the founder of the Hastings Center, an ethics think tank, mistakenly thought that science was on the verge of cloning, he described its awesome power: ‘One could imagine taking a single sloughed cell from the skin of a person’s hand, or even from the hand of a mummy (since cells are neither ‘alive’ nor ‘dead,’ but merely intact or not intact) and seeing it perpetuate itself into a sheet of skin tissue. But could one really visualise the cell forming a finger, let alone a hand, let alone an embryo, let alone another Amenhotep?’” (Kolata, 1998: 3).

Gaylin was not alone in his sense of awe. “Interest in the nature of our individuality and its possible manipulation by others is a familiar theme in popular culture and has been a staple of science fiction for decades” (Wellcome Trust). The concept of cloning was brought to public awareness by books such as Aldous Huxley’s *Brave New World*, which described a dystopian future where people were created with specific traits suited to their predetermined societal role. Ira Levin’s *The Boys from Brazil* involved the creation of numerous Hitler clones by an international Nazi organisation intent on recreating the Third Reich.

Just as it appealed to the general public, cloning has also long been a subject of interest to the media.

“It is one of the most sought-after coups of 20th-century journalism... – the first story that can plausibly use ‘human’ and ‘clone’ in the same headline” (Adler & Hager, 1993: 61).

The appeal of cloning to the media has been explained as follows: “the cloning story is a rich combination of personality, sex, business, ethics and very serious questions about legal constraints on disease research – spiced with a generous dollop of creepiness. It’s an irresistible mix for any reporter” (Zitner, 2003: 25).

However, according to the Center for Genetics and Society in the United States, mainstream media coverage of cloning has been inadequate or misleading. The organisation points out that too much reporting on cloning and associated biotechnology issues is “reflexively celebratory and triumphalist” with new techniques described as ‘breakthroughs’ or ‘medical miracles’ even when they are preliminary or very controversial. Furthermore the statements of, or potential conflicts of interest between, scientists and bioethicists are rarely scrutinised by the press to the same extent as those of politicians or business leaders. Media accounts also often fail to clarify the full importance of the ethical aspects with regards to cloning (Center for Genetics and Society).

These findings correspond with Nelkin’s (1995) characterisation of science coverage in general, and are cause for concern.

The reason for the concern is that, when reporting on subjects such as cloning, the media play an important role in educating the public (Rensberger, 1997). Cloning is an important issue and has serious implications for public policy (Hargreaves, Lewis & Speers, 2003: 12). “It is the kind of issue that people in a deliberative democracy should know something about.”

In this mini-thesis I investigate how the three major daily newspapers of the Western Cape report on cloning. Yet, the media does not exist in a vacuum. Scientists interact with journalists and often provide information for articles (Hartz & Chappell, 1998) while the media’s perception of public interest can influence the content of reports

(Nelkin, 1995). However, the relationship between the newspapers and these two interest groups falls outside the scope of this study.

Instead, the emphasis is on how the *Cape Argus*, *Cape Times* and *Die Burger* report specifically on the ethical and scientific aspects of cloning. In broad strokes, the scope of this research can be summarised by the following three questions:

- Does the coverage focus on the ethical or scientific aspects of cloning?
- Is cloning reported in a positive or negative tone?
- Is the science of cloning adequately explained?

While completing preliminary research, I found that large amounts of in-depth research have, in particular, been completed on media reports of Dolly. These include research by Wilkie and Graham (2001) and Nerlich, Clarke and Dingwall (2000). Alternatively, research, such as that done by Bruce Lewenstein and Matthew Nisbet at Cornell University, has tended to focus on the reporting of science or biotechnology in general. I found only the 2003 *Towards a better map: Science, the public and the media* report providing recent in-depth research results on the coverage of cloning. However, as with the other articles mentioned, this research was based outside South Africa.

Despite being South African based, Carine van Rooyen's 2002 'Report On Science and Technology Coverage in the SA Print Media' covers the reporting of science in general.

The aim of my study is to provide a current, exploratory look at the coverage of cloning within a South African context. However, it is important to note that my research is only intended to represent the coverage of cloning in the three Western Cape daily newspapers during a period of one year. It would be presumptuous to assume that my findings will be relevant to other countries or even other regions within South Africa.

This mini-thesis comprises seven chapters, the first being this introduction which serves as background to the study topic. Chapter 2 and 3 offer additional background information. The former covers the role of the media in general, while the latter provides a simple summary of the science of cloning. Chapter 4 is a literature review

outlining the findings of previous studies relating to media coverage of cloning or science in general. It is divided into three sections: the emphasis of science or ethics, the tone of coverage (positive or negative), and the explanation of science (including challenges to explaining science). Chapter 5 introduces the actual study, including methodology and research questions. Chapter 6 provides the results and an in-depth discussion thereof with regards to the literature review and shortcomings of the research. Chapter 7, in turn, concludes the thesis, summarising the main points and providing recommendations for future research. Lastly, references are attached.

## Chapter 2

### Role of the media

In response to Clonaid's announcement that it had cloned a human ("Eve") in December 2002, the *Cape Argus* published an editorial on 3 January 2003 calling for sensible controls over cloning technology. "But who should do the controlling?" asked the piece ("Controlling cloning", 2003). "If we are to retain our grip on democracy as a reasonable way to govern ourselves, then it will be ordinary people. Clearly, our first responsibility is therefore to ensure that we're informed and capable of arriving at a rational, humane solution" it concluded.

The media play a vital role in keeping people informed. When formal education in science ends, the majority of people get most, if not all, of their information about science from the media (Hartz & Chappell, 1997). According to Nelkin (1995: 12), "For most people, the reality of science is what they read in the press."

Not only providing information about scientific discoveries, controversies and the work of scientists, the media is a major source of information about the implications of this work (Van Rooyen, 2002). According to the *Towards a better map* study, "the media clearly play a role in informing the way people understand science" (Hargreaves et al. 2003: 4).

And "information and understanding are necessary if people are to think critically about the decisions they must make in their everyday lives," offers Nelkin (1995: 12).

"As science writers, our challenge is not only to describe the discoveries and the changes clearly, but to explain their potential impact and their costs and benefits, even while we present the valid sides of the controversies they generate" (Perlman, 1997: 4).

"Good reporting can enhance the public's ability to evaluate science policy issues and the individual's ability to make rational personal choices; poor reporting can mislead and disempower a public that is increasingly affected by science and technology and by decisions determined by technical expertise" (Nisbet & Lewenstein, 2001: 7).

Van Rooyen (2002) suggests two other important reasons for accurate scientific information to be conveyed by the media:

- The public's participation in science debates, through the media, leads to the funding of research projects and helps society to act "wisely and intelligently" – particularly with regard to science policy issues.
- A society devoid of scientific knowledge can lose its economic competitive edge.

But the media not only serve as a primary information source for the public. They can also influence the actions and opinions of the public and policy-makers (Nisbet & Lewenstein, 2002).

According to Mazur's Coverage-Attitude Hypothesis (as cited in Wilkie & Graham, 2001), a rise in the quantity of media coverage appears to coincide with a rise in reaction against a scientific technology.

"The media, perhaps more than any other slice of culture, influence what we think and talk about, what we take to be important, what we worry about" (Hopkins, 1998: 7).

Media messages often reflect legitimate concerns and have real effects. They can, for example, shape the way people think about a new technology such as cloning, assess the impact of the science, and develop ways to control the technology (Nelkin & Lindee, 2001).

Personal orientation to new technology is difficult for individuals to assess, because they are likely to have only a few, if any, experiences with this technology. Therefore, personal orientation to new technology is highly, if not completely, dependent on media coverage (Schenk & Sonje, 2000).

According to Hopkins (1998), when the birth of Dolly was announced, most people were well informed about the ethics of cloning, even before they knew exactly what the scientific process of cloning entailed.

“Media coverage fixed the content and outline of the public moral debate, both revealing and creating the dominant public worries about cloning humans. Without having read a single article, heard a single presentation, or taken a single bioethics class, most Americans have already received training in the ethics of cloning” (Hopkins, 1998: 8).

Much of this influence can be attributed to the use of frames, powerful organisational structures used by journalists in the explanation of complex issues (Nisbet & Lewenstein, 2002). Cloning is one such issue. Frames organise events for journalists, helping them process large amounts of information, select what is news, and present the information in an efficient form so that the public may understand it (Nelkin, 1995).

Huxford (2000) defines frames as “chain associations” that cluster around a single image or phrase, directing the reader into familiar thought processes.

Frames may consequently be triggered by a single image or phrase (Wellcome Institute). The single image acts as a cue that draws in a string of themes, values and opinions. These, in turn, automatically create oppositions to views, values and associations conflicting with those of the message conveyed (Huxford 2000).

Public opinion can therefore be influenced by the choice of frame. A particular frame may stress specific values or facts and bestow them with greater importance or relevance than they might appear to have under an alternative frame (Nisbet & Lewenstein, 2002). By their selection of details, journalists equip readers to think about science and technology in specific ways (Schenk & Sonje 2000).

According to Schön and Rein (as cited in Nisbet & Lewenstein, 2001), once an issue is framed by the media early on in a debate, it can be very difficult for policymakers to shift the image of the issue to another perspective.

Popper (as cited in Huxford, 2000) suggests that on those occasions when more typical news frames are inadequate, journalists turn to models from popular culture, such as films and novels. However, these cultural models are not transparent frames that merely organise events into easily discernible patterns. They feature their own discourses, which will inevitably colour the events upon which they are superimposed.

With regard to cloning, frames drawn from popular science fiction have been well used. For example, by comparing cloning to such texts as *Frankenstein*, journalists are able to convey a feeling of fear or distrust towards the technology (Hopkins, 1998).

But, it is important not to overestimate the ability of the media to affect public opinion (Salleh, 2003).

According to Susanna Hornig Priest, of the Journalism Department at Texas A&M University, studies into the effect of the media show that the press only tell people what things to think about ('agenda setting'). The media don't necessarily have a strong influence on exactly what the readers' views are going to be ('opinion formation') (Salleh, 2003).

it is clear, however, that the media play an important role in keeping the public informed on scientific developments. This information extends beyond the straightforward facts to explaining the implications of the development. In addition to providing the information that can help the public to understand and possibly act on the development, the media have the potential to influence public opinion. Media frames, which are often used in the coverage of complex subjects such as cloning, play an important role. However, these frames are sometimes drawn from popular culture and inevitably influence the tone of the reporting on a subject that is technically complex. It is these technical complexities that are addressed in the following chapter which provides a basic introduction to the science of cloning.

## Chapter 3

### What is cloning? The science explained

Coined by the British biologist J.B.S. Haldane in a 1963 speech and derived from the Greek word for “twig”, the term “clone” refers to an exact copy of a gene, cell, or whole organism.

Essentially “cloning is a term applied to producing an exact copy,” says Keith Campbell, one of the scientists at the Roslin Institute responsible for the cloning of Dolly (Klotzko, 2001: 4).

Cloning is a form of asexual (without sex) reproduction that commonly occurs in nature (Wilmut, Campbell & Tudge, 2001). All living things reproduce, and the easiest way to achieve this is simply by dividing. For example, bacteria and single cell organisms multiply by dividing into two – a process known as “binary fission”. All the cells of the body reproduce themselves in this manner, the two resulting cells containing genetic information identical to that of the original.

Certain corals and fungi develop buds that detach from the parent and grow into individuals that are genetically identical to the parent (Tamarin, 1998). Strawberry plants sprout modified stems, known as runners, which give rise to separate plants that are genetically identical to the original. In fact, all offspring produced through asexual reproduction obtain all of their genetic information from a single parent.

With sexual reproduction, however, the female’s egg cell is fertilised by a male’s sperm cell. With the egg and sperm cell each containing half the number of chromosomes needed to create a new individual, fertilisation results in a cell containing half the genetic information from the father and half from the mother (Wilmut et al., 2001).

Yet, cloning can occur naturally in sexually reproducing organisms, such as humans. The splitting of a fertilised egg to form identical twins is a natural form of cloning, with identical twins essentially being clones of each other (Freudenrich).

With this natural occurrence of cloning, scientists have long been interested in the possibility of artificially cloning animals (Tamarin, 1998) and in 1938, the German scientist Hans Spemann proposed a 'fantastical experiment' involving the transfer of a nucleus from one cell to another (Kolata, 1998). The first practical steps towards cloning were taken in the early 1950s with a series of experiments on frogs involving Spemann's nuclear transfer technique. In 1952, Robert Briggs and Thomas King succeeded in producing tadpoles from body cells of frog embryos. Such embryonic cells are relatively unspecialised and have the potential to develop into any type of differentiated adult cell.

Their work was followed by that of John Gurdon who, in 1966, used nuclear transfer to produce adult frogs from tadpole intestinal cells. This experiment proved that even cells that have undergone a large degree of specialisation remain 'totipotent' (Tamarin, 1998), which is defined as "the ability of a cell to give rise to descendant cells that may differentiate to form any of the kinds of tissue of an organism" (Wilmut et al., 2001: 262). In other words, Gurdon discovered that, under certain circumstances, specialised cells were not fixed in their roles and could give rise to any other type of body cell. The implication is that all of a fully developed organism's body cells contain a complete set of genes. Cell specialisation occurs because certain genes are active in some cells and inactive in others.

Yet, despite Gurdon's discovery and success with frogs, scientists were unable to replicate his experiment successfully when using the cells of adult vertebrates during nuclear transfer. However, experiments proved successful when embryo cells were used. By the 1980s scientists had cloned a number of animals including mice, rabbits, and sheep using undifferentiated cells taken directly from early embryos (Roslin Institute). Scientists thus concluded that the cells of mature vertebrate animals are simply too specialised to be cloned (Kolata, 1998) and that fully matured cells lost their totipotency. In other words, they believed that the genes that had been 'switched off' when a cell became specialised could not be 'switched back on' to allow for the development of any other specialised cell type (Oakridge National Library).

However, in 1996, a team of researchers at the Roslin Institute were able to clone a sheep from the cell of an adult animal, using the nuclear transfer technique that had, until then, proved unsuccessful. One of the researchers, Keith Campbell, explained the so called "somatic cell nuclear transfer technique" (SCNT) as follows: "Nuclear

transfer is a technique whereby an animal may be produced from a nucleus, originating from a single cell, that is transferred to an enucleated egg, an egg from which the genetic material has been removed. The cells providing the nucleus can be from embryos, fetuses, or adults" (Klotzko, 2001: 5).

In simple terms the SCNT process involves removing the nucleus, which contains the cell's genetic material, from an animal's unfertilised egg cell through a process known as enucleation. The nucleus from the body cell of another animal of the same species is then transferred to the egg cell. Subsequently the egg cell begins to divide and develops into an embryo. Since the embryo's genes originated from the body cell's nucleus, the embryo is genetically identical to the animal from which the body cell was taken (Freudenrich).

What the Roslin team did was to take the mammary-gland cells from an adult sheep and place them in a solution for a few days. The solution caused the cells to stop growing by starving them of nutrients. It is this cell-starvation that allowed the adult mammary gland cells to regain their totipotency (Tamarin, 1998). The starved cells entered a resting state, known as "G0", where they stopped growing and making proteins from their DNA (Griffin, 1997). Cells that stop growing are easier to reprogram (Tamarin, 1998).

Using a spark of electricity, each starved mammary cell was fused with an enucleated egg cell. Subsequently each cell was cultured for five to six days, (Roslin Institute) during which time the nucleus of the mammary cell was reprogrammed to regain its totipotency (Tamarin, 1998). The programming of a nucleus is an interactive process between the nucleus and cytoplasm – the material surrounding the nucleus. The cytoplasm sends messages to the nucleus that determine which genes are switched "on" and "off". The cytoplasm of the egg cell was therefore able to reprogram the mammary cell nucleus with which it had fused.

During the five to six days in culture, the resulting cells grew into embryos, which were then transplanted into 'foster mothers' or 'surrogate sheep'. The process was repeated 277 times with only one lamb, Dolly, eventually being born (Wilmut et al., 2001).

While the technique continues to be used to clone adult animals such as horses and sheep, the animals produced by SCNT are not 100% genetically identical to the

donor animal (Oakridge National Library). Some of the clone's genetic materials come from structures in the cytoplasm of the enucleated egg. These structures, known as mitochondria, produce energy for the cell and contain their own short DNA segments (Oakridge National Library).

Nevertheless, SCNT is the preferred technique in both reproductive and therapeutic cloning. The former is defined as the cloning of a whole organism – which currently involves animals, but could, in the future, apply to humans as well. Therapeutic or research cloning, in turn, relates to the cloning of cells, organs or other tissues for stem cells or transplant tissues and primarily applies to humans (Public Understanding of Biotechnology).

According to the proposed National Health Bill of South Africa, therapeutic cloning is defined as the “manipulation of genetic material from adult, zygote or embryonic cells in order to alter the function of cells or tissues” (Public Understanding of Biotechnology).

Most controversially, therapeutic cloning could involve the production of human embryos. An embryo is created in the same manner as those used during the reproductive cloning of animals, with the nucleus of a patient's cell fusing with an enucleated egg cell. However, the resulting embryo is not implanted in a surrogate mother. The aim of this process is not to create cloned humans but to produce what are known as embryonic stem cells that incorporate a patient's genetic matter. Totipotent and with the ability to self-replicate, these stem cells are the precursors to tissue cells and can differentiate into any specialised cell type (Cogle, Guthrie, Sanders, Allen, et al., 2003).

Once the cloned embryo has started dividing and reached the blastocyst stage, essentially a hollow ball of cells, the stem cells are extracted from the embryo (Byrne & Gurdon, 2002). These cells can then be made to differentiate into cells which could potentially be used to grow a specific tissue or organ in the laboratory. Since the resulting tissue or organ would be genetically identical to the patient, the problem of immune rejection would be eliminated. Alternatively, the precursor cells could be injected into the patient's body to cure or treat the symptoms of a degenerative disease, or repair damaged or defective tissues in the body. Diseases that could potentially be treated by this procedure include heart disease, diabetes, Parkinson's, Alzheimer's and cancer (Byrne & Gurdon, 2002).

However, there is opposition to this use of therapeutic cloning, as a human embryo is created and then destroyed when the embryonic stem cells are removed. A potential person is thus being killed (Byrne & Gurdon, 2002). As a result, the United States and other countries are calling for a ban on all human cloning, which includes the use of embryonic stem cells (Public Understanding of Biotechnology). As a result, researchers are investigating alternatives, including adult stem cells – totipotent cells remaining in adults. These can harmlessly be removed from a person and have almost the same potential as embryonic stem cells.

Beyond its scientific complexities, cloning thus has serious ethical implications resulting in both positive and negative attitudes towards the technology. The literature review that follows will highlight how these aspects have been addressed in media coverage of cloning.

## Chapter 4

### Literature review

This literature review has been divided into three sections, each focusing on a particular area of the research scope.

#### 4.1 Science or ethics

*Towards a better map: Science, the Public and the Media* provides an in-depth assessment of the UK media's role in the public understanding of science (Hargreaves et al, 2003). As part of their study, the researchers analysed the way science and science-related subjects were reported in the British media during a seven and a half month period in 2002. They focused on the coverage of contemporary issues, which included cloning and genetic medical research grouped together as a single issue.

Their study found that "reports tend to be scientifically technical, or else avoid all mention of science and concentrate on the ethical aspect of genetic medical research" (Hargreaves et al, 2003: 26).

Unfortunately this dichotomous nature of reporting is problematic as the scientific and ethical issues are inexorably linked.

"However we need to understand something about the science of cloning and genetic medical research if we are to make the ethical judgments that place this issue in the public domain" (Hargreaves et al, 2003: 27).

Yet, if this dichotomy exists, do the media place greater emphasis on the science or ethical aspects of cloning?

According to Nisbet and Lewenstein (2002), ethical considerations received an increased amount of coverage in the late 1990s US media. Their study of biotechnology-related coverage in the American 'Elite Press' between 1970 and 1999 noted significant changes in articles from 1995 onwards. For the first time, in 1997 and 1998, they found an increased focus on ethical issues, with ethical frames

appearing in approximately a third of all biotechnology articles in the later 1990s. The shift was matched by the topic of cloning taking centre stage in the media's coverage of biotechnology.

Citing Berkovitz, the authors provide a possible explanation for the increased ethical emphasis. Scientists are usually the dominant sources in science and biotechnology coverage, often to the exclusion of contradictory voices. However, crises or dramatic focusing events, such as the cloning of Dolly the sheep, can sometimes create a change in selecting sources.

In response to the cloning events of 1997, the inclusion of reactions from bioethicists, religious leaders, political figures, and other contradictory voices was increased. "Journalistic orientations towards controversy, conflict, and drama resulted in an emphasis on the ethical implications of cloning technology" (Priest as cited in Nisbet & Lewenstein, 2002).

Nisbet and Lewenstein's findings were repeated in their separate study of biotechnology-related articles in *The New York Times*, *The Washington Post*, *The Los Angeles Times*, *St. Louis Post-Dispatch*, and *Newsweek* from 1995 to 1999 (Nisbet & Lewenstein 2001). Their analysis once again found that the cloning of Dolly transformed the media's coverage of biotechnology. Reports moved from an emphasis on economic prospect and progress, associated with the promises of science, in 1995 and 1996 to a more complex inclusion of issues concerning ethics, regulation and public opinion.

This shift in emphasis towards ethical, rather than scientific, issues is also apparent from studies of the media's cloning coverage post Dolly.

"Stories about cloning were not merely about the procedure. In fact, they were not even predominantly about the procedure" (Hopkins, 1998: 9). Instead, suggests Hopkins, the story was about the morality of cloning. The media instructed the public on the major ethical concerns of cloning, its social, religious, and psychological significance, and the motivations behind it. "Media coverage fixed the content and outline of the public moral debate, both revealing and creating the dominant public worries about the possibility of cloning humans" (Hopkins, 1998: 10).

Hellsten (2000) concurred. He states that, in the media coverage following the announcement of Dolly's birth, the debate soon shifted from the technical details of cloning as a procedure to the possibility of cloning human beings in the near future. This, in turn, resulted in ethical and legal questions about whether existing laws regulate human cloning and possible banning of the process. "The cloning of a lamb was immediately set in a context of other fears about genetics and genetic manipulation" suggest Nelkin and Lindee (2001: 85).

Other commentators were less subtle in their assessment of the media's focus. "Dolly immediately provoked a heated debate about the ethics of human cloning, during which the sweet face of Dolly the sheep was soon replaced in the press by the face of Frankenstein's monster" (Nerlich, Clarke & Dingwall, 2000: 53).

In fact, according to Dr Harry Griffin (1998) of the Roslin Institute, all the media coverage following the announcement of Dolly was "certainly not about sheep", adding that "much of the media speculation was based on science fiction rather than good sense" (Griffin, 1998).

Griffin was not the only scientist to think so. As the ethical debate resulted in increased political and social pressures on scientists they responded in order to defend the importance of their work. Media images were "selling science short" claimed the scientists (Nelkin & Lindee, 2001: 89).

According to Wilkie & Graham (2001), as the Dolly story unfolded in the British press one could see "a tension between the scientists' desire to keep the discourse to the scientific context where they were figures of authority, and the desire of the press to discuss the cultural context of cloning" (Wilkie & Graham, 2001: 138).

While many traditional ethical concerns are generated by the subject of cloning, Hopkins (1998) found that the media focused overwhelmingly on a perceived threat to individuality and uniqueness. They also focused on two other related worries when characterising cloning as an ethical issue:

- the pathological motivations of anyone who would want to clone;
- the fear of "out-of-control" science creating a "brave new world."

However, despite the ethical hype around the Dolly story, ethicist Donald M. Bruce doubts whether the saturation coverage led to a comparable degree of understanding of the issues raised by Dolly's birth. The competitive scramble of the media to cover the event and its implications resulted in "a strange mixture of science fact and fiction, sometimes inextricably entwined." Bruce concluded that the instant nature of media reporting is not conducive to careful ethical reflection on novel and complex issues.

Nevertheless, the emphasis was not only on ethics, with Wilkie and Graham (2001) noting a distinct difference between the coverage of Dolly's birth in Britain and the United States. The authors found that the American popular press featured "copious scientific detail...whereas British papers provided parsimonious scientific reporting" (Wilkie & Graham, 2001: 145). Rather, as already noted, the British press attention focused on ethical concerns and the implications for humans.

The difference in the amount of science featured was attributed to manpower, with *The New York Times* employing more science writers than all British broadsheets combined, as well as the lack of developmental biology training amongst British science journalists (Wilkie & Graham, 2001). The authors also suggest that scientists, on whom journalists would rely for an explanation of the scientific facts, in Britain are less willing to deal with the press than their American counterparts are.

Dr Richard Holliman, Lecturer in Science Communication and the Public Understanding of Science at the Open University in the UK, offers another possible explanation for the ethical, rather than scientific, emphasis. He believes that part of the reason is that Dolly did not have immediate therapeutic implications (Holliman).

To illustrate his point, Holliman cites the media coverage given to Polly, another sheep created by the Roslin Institute. Born a year after Dolly, the sheep was not only cloned but also genetically modified so that she carried a human gene coding for human protein factor IX involved in blood clotting. Since the factor is secreted in her milk, the sheep potentially has important therapeutic value. As a result, according to Holliman, the Polly story was largely reported in terms of the scientific details and therapeutic benefits. However, he contends that the news generated far less coverage and is not widely remembered (Holliman).

Nevertheless, the *Towards a better map* study found that by 2002 still a minority of British newspapers were reporting cloning in terms of the scientific details. Less than a third (32%) of British newspaper articles analysed explained the scientific rationale behind cloning and genetic research (Hargreaves et al, 2003).

However, Blond (2002) found that throughout Europe the emphasis of reports on cloning differed from one country to the next. In Germany and France, the press tends to focus on theoretical debates surrounding the ethics of cloning. In the former country, for example, the publication of *Rules of the Human Zoo*, a book perceived as a justification of eugenics, triggered a long-running ethical debate on cloning in the media. In contrast to such theoretical debates, the Italian media tends to focus on the practical, scientific implications of cloning addressing the specific benefits derived from current research.

The next portion of this literature review will focus on whether the media tend to focus on those benefits, addressing cloning in a positive tone, or use a negative tone when reporting on the subject.

#### **4.2 Positive or negative tone**

The 'Report On Science and Technology Coverage in the SA Print Media' (Van Kooyen, 2002) aimed to determine the status of science and technology reporting in the South African press. It found that the South African press appears to have a positive attitude towards science and technology in general:

- Overall, the evaluative tone of the coverage was more positive (70% of articles) than negative (30%).
- In terms of communicating benefits and risks, 42% of the articles seemed to promote the benefits of science and technology. Only 14% tended to promote the risks of science and technology, while 15% paid equal attention to risks and benefits.

Over in the United States the character of biotechnology-related coverage has historically been overwhelmingly positive, with a heavy emphasis on scientific progress and economic prospect. Biotechnology coverage between 1970 and 1994 was typified by "an overwhelming absence of reporting on controversy, with coverage

of benefits greater than coverage of potential risks” (Nisbet & Lewenstein, 2002: 268).

The authors cite a possible reason for this emphasis on benefits. Journalists prefer university scientists as sources since they are thought to offer objective or neutral perspectives (Priest, as cited in Nisbet & Lewenstein, 2002). Since university scientists involved in biotechnology research are often more positive in their outlook than other university scientists, the unintended result is a likely pro-biotechnology bias in media coverage, courtesy of the source (Priest and Gillespie, as cited in Nisbet & Lewenstein, 2002).

However, a change in the outlook of media reports occurred in the late 1990s (Nisbet & Lewenstein, 2002). The political debate over cloning, and to a lesser extent gene therapy and agricultural biotechnology, brought about a greater media emphasis on controversy and the potential negative aspects of science. Nevertheless, it was usually associated with a proportional increase in positive coverage. The authors suggest two possible influences:

- During political controversies, parties on both side of the debate increase their lobbying of the media, thus creating a number of competing claims that can be covered in reports.
- Journalism’s objectivity norm tends to create a polarising effect, as every negative consideration featured in an article is counterbalanced by a positive consideration.

This polarising effect is apparent in various descriptions of post-Dolly coverage. According to Erik Parens, associate for philosophical studies at the Hastings Center: “On the one hand you have people who fear the cloning of Hitler and on the other side you have overblown claims about the enormous and immediate medical benefits of cloning” (Kreeger, 1997: 1).

Nelkin and Lindee (2001: 86) described a similar polarity. “The messages evoked by Dolly have ranged from promises of progress to portents of peril, from images of miracles to visions of apocalypse.”

According to Hellsten (2000) cloning is either seen as apocalyptic progress and a symptom of Frankenstein's work, or a beneficial development allowing the creation of perfect products.

"Cloning has not been reported as an unmitigated evil. The potential medical and agricultural benefits are usually mentioned. These benefits, however, are always juxtaposed to the dangers of cloning in alarmist, emotion-packed ways – moderately useful medicines and improvements in animal research versus a 'brave new world'" (Hopkins, 1998: 8).

This tendency for the coverage of cloning to have such contradictory viewpoints reflects society's attitudes towards science in general. Although we welcome science and technology as a key to progress and as a solution to problems, we are increasingly preoccupied with risk, fearing those same technologies we most depend upon (Nelkin, 1995).

Kitzinger and Reilly (as cited in Hargreaves et al., 2003) provide a more formal approach to the polarity of coverage. They have found that reports on human medical genetic research, which includes cloning, are framed in one of two ways. The 'great promise' discourse focuses on the 'benefits the science can bring' and relies on an understanding of the medical potential of genetic medical research. The 'concern' discourse focuses on the 'risks associated with the application of knowledge gained'.

"Both the 'great promise' and 'concern' frameworks have their own conventions. The former focuses on cutting edge medical breakthroughs and the promise of healing currently untreatable conditions. The latter, in turn, points in alarm to the excesses of irresponsible scientists" (Hargreaves et al., 2003: 27).

Just as Lewenstein noted an increase in reporting on negative attitudes towards science, the *Towards a better map* study found that British media coverage seems to favour the 'concern' framework. The authors suggest that this framework is generally more "dramatic and engaging" than the 'great promise' discourse, hence its prevalence in media reports.

In the months following the announcement of Dolly, cloning was, for example, compared to weapons development. Furthermore, "many news stories have reflected mistrust of scientists and the fear that the outrageous possibilities suggested by

cloning a sheep will eventually, perhaps inevitably, be realised in human beings. News headlines frequently suggest that science cannot be controlled: 'Science fiction has become a social reality'. 'Whatever's next?' 'Pandora's Box'" (Nelkin & Lindee, 2001: 88).

Yet, it has been shown that the positive or negative tone of articles on cloning depends on the publication's agenda and priorities.

Hellsten (2000) analysed media reports on Dolly, looking at the use of metaphors in particular. She found that while *The London Times* popularised the event and used metaphors of cloning to reinforce cultural views of mad scientists, *Nature* defended science's interests and emphasised the benefits of the research. Ironically, the same metaphors were used to convey both perspectives.

The use of the metaphor "clones are mass products" showed up the differences between the publications. In *The London Times*, the metaphor was used to characterise clones as inferior assembly-line products that lacked the quality and uniqueness of the original. *Nature*, in turn, described clones as perfectly similar products, of equally high quality as the original (Hellsten, 2000).

In a more general study, Nerlich, Clarke and Dingwall (2000) found similar trends. Tabloids that portrayed the negative sides of cloning, for example, used descriptions of clones as photocopies. "As copies are normally worse than the originals, have less value than the originals, are less perfect than the originals, so, it was argued, are clones." But scientists, when quoted in scientific journals, were found to use the term "copy" to convey an entirely value-free, literal meaning (Nerlich et al., 2000: 59).

The differences continued with the use of the metaphor "scientific progress is a journey" (Hellsten, 2000). *The London Times* emphasised the "apocalyptic nature" and the speed of this progress, as well as the uncertainty of where the development might lead if not stopped. In contrast, *Nature* opposed all kinds of "blocks on the scientific road" as purposeless and actually slowing down the creation of useful mass products such as organs.

Popular science fiction was one of the arenas that provided most of these metaphors and the frames used in the reporting of cloning (Huxford 2000).

In a sample of 204 articles from Britain and the United States, in which cloning was the principle focus, 46% featured science fiction frames. Of these, the tone of the vast majority was negative, raising fears of the future use of the technology and a suspicion of science – particularly with regard to reproductive human cloning (Huxford 2000).

The frames emphasise the anti-science themes intrinsic to science fiction, which include:

- A distrust of science and scientists
- The placement of man and science in opposition to God and nature
- A fear of the loss of individuality

Cloning has long been a theme in science fiction stories (Silver, 1998) including *Frankenstein*, *Brave New World* and *The Boys from Brazil* (Nerlich et al., 2000). “Most of these stories tend to be traditional narratives of divine retribution for violating the sanctity of human life. These days they employ the language of genetics and they often dwell on the horrible consequences of genetic manipulation” (Nelkin & Lindee, 2001: 84).

Nerlich and her colleagues (2000: 64) suggest that the science of cloning and the negative portrayal of cloning in science fiction were constantly intermeshed during the twentieth century, to such an extent that “when cloning became a scientific reality, this reality was instantly portrayed as a nightmare.”

According to Huxford (2000), the use of science fiction references in the newspapers had more to do with triggering certain cultural fears than with providing an understanding of cloning. Nerlich et al. (2000) described the allusions to science fiction narratives as standardised and stereotyped.

*Frankenstein*, emphasising in particular the distrust of science and man’s hubris, is an explicitly negative symbol “making it such a boon for journalists” (Huxford, 2000: 189). Ironically the story does not even deal with cloning. *The Boys from Brazil* was also the “ideal vehicle for the sort of fear-based frame to which newspapers often resorted in the cloning coverage” (Huxford, 2000: 190). Journalistic references to *Brave New World*, in particular, highlighted the fear of a dystopian future and of what progress may bring (Nerlich et al., 2000).

In another study, the tone of the popular media was found to be particularly negative when specifically describing reproductive human cloning and those in favour of it (Hopkins, 1998). Those in favour are portrayed as corrupt or misguided, and Hopkins characterised negative stereotypes used by the media to describe them. These include egotistical people with enough money who can clone themselves if they so desire (The Megalomaniac) and the so-called Replacement Child. The latter is a more sympathetic motivation for cloning, describing a couple that hopes to “replace” a dying child. However, according to the stereotype, the couple are described as particularly misguided and pathologically unable to accept the reality of death.

Overall, Hopkins found the attitude of the media towards human reproductive cloning, in particular, to be strongly negative. While media reports described the benefits of cloning research “we are already being trained to suspect anyone who might want to use the technique of pathological, pathetic, or gruesome tendencies. In fact, we have been told implicitly and explicitly that the only motives for cloning adults are vicious” (Hopkins 1998: 13).

But have the public been told about the scientific aspects of the cloning process? The final portion of this literature review will examine how, and if, the actual science of cloning has been reported in the media before highlighting potential threats to accurate accounts of the scientific aspects.

### 4.3 Explanation of science

*Towards a better map: Science, the public and the media* (Hargreaves et al., 2005) reveals that the scientific context is frequently omitted from British newspaper articles about genetic medical research and cloning. According to the study an article was considered to have explained science explicitly if it featured more than one sentence explaining the science associated with the particular story.

The *Observer* explained the science in slightly less than 20% of its articles, while just below 30% of genetic medical research and cloning articles in the *Daily Mail* explained the science involved. However, six newspapers explained the science in 10% of articles.

The definition of stem cells was also investigated. *The Mail on Sunday* did not define stem cells in any of the qualifying articles, five newspapers provided a definition in 5% to 10% of articles, while two defined stem cells in between 10% and 20% of articles.

Similarly, when Severino Antinori announced his intention to start human cloning by November 2001, the resulting news reports dealt “very economically” with the actual science of human cloning (Barratt & Jackson, 2001).

“*The Borneo Bulletin* (13 August) said: ‘The nucleus of a woman's body cell is transferred into one of her eggs to begin the process which eventually leads to the creation of an embryo. The embryo is then transferred into the woman's uterus to establish pregnancy.’ Hey presto” (Barratt & Jackson, 2001: 406).

The authors point out, however, that some papers did make a clear distinction between therapeutic as well as reproductive cloning, and that any blurring of terms seemed to come from Antinori himself.

Yet, accuracy in scientific reporting should not be neglected.

As previously discussed, the media play an important role in the education of the public and as the *Towards a better map* study indicates, it is necessary for people to understand something about the science of cloning if they are to make ethical judgements about it.

The UK House of Lords Select Committee on Science and Technology Third Report, advises that newspapers and periodicals take care not to publish inaccurate, misleading or distorted material.

In fact, it has been suggested that frequent misrepresentations of science foster negative public perceptions of both science and the media (Nisbet & Lewenstein, 2001).

However, more than 75 percent of American scientists believe that the media, when covering science, “are more interested in sensationalism than the truth, that media coverage concentrates too much on trendy discoveries rather than basic research and development, and that the media exaggerate risks, unduly alarming the public” (Hartz & Chappell, 1998: 43).

But what are the misrepresentations with particular reference to cloning?

“The most significant problem with the media coverage of cloning is the easy assumption that humans simply are a product of their genes” (Turner, 1997: 4).

“Genetic essentialism” is what Dorothy Nelkin and Susan Lindee call this idea that “human beings in all their complexity are simply readouts of a powerful molecular text” – DNA (Nelkin & Lindee, 1995: 3). Their book *The DNA Mystique* tracks the popular appeal of genetic essentialism in adverts, articles, television programs and films, finding repeated messages that reinforce the idea.

Most reports on cloning try to explain some basic genetics and try to clarify some of the misconceptions about genetic essentialism (Hopkins, 1998). Philosophers, geneticists and other experts have repeated that, although human behaviour has a genetic component, a host of so-called “nurture” factors also play important roles in a person’s development (Turner, 1997). These diverse factors include personal experiences and ensure that monozygotic (identical) twins have unique, individual personalities despite sharing identical DNA.

But media reports on cloning continue to reinforce the idea of genetic essentialism (Nelkin & Lindee, 2001).

“Reflecting deterministic assumptions of genetic essentialism, media stories have suggested that clones would surely be identical products of their genes” (Nelkin & Lindee, 2001: 87). The assumptions are apparent in such stories predicting that, in the future, cloning will allow the resurrection of the dead. Or cloning will provide everlasting life for the deserving (or wealthy) who wish to produce copies of themselves (Turner, 1997).

Despite the emphasis on genetic essentialism, Hopkins (1998) found that United States media reports contained little evidence that the public does in fact believe in genetic determinism. “The reports simply assume that it does and then attempt to disabuse the public of its error” (Hopkins, 1998: 8). However, according to Hopkins most media stories engaged in confusing, contradictory double talk. The images and headlines convey messages that clones will be exact copies, but the stories themselves attempt to educate the public that clones will, in fact, not be exact copies.

Potential causes of such misunderstandings and inaccuracies are the inherent nature and constraints of science journalism as described by Dorothy Nelkin in her book *Selling Science*. The two factors relating to the inherent nature of science journalism are objectivity and scepticism.

According to Nelkin, journalists generally attempt to provide balance by reporting on opposite sides of an issue. Although journalists accept this concept of objectivity as the basis for accurate reporting, values like ‘balance’ and ‘fairness’ have little relevance to the scientific community or the understanding of science. Scientific standards of objectivity require “empirical verification of opposing hypotheses” (Nelkin, 1995) instead of balancing the opposing viewpoints. Furthermore, by simply balancing the viewpoints journalists tell their readers little about the scientific significance of different views.

Hornig Priest adds that the journalistic standard of objectivity is problematic in covering science “because it could ignore, distort or misrepresent the existence of scientific consensus and give too much support to minority points of view” (Salleh, 2003). This kind of “balance” is not always helpful or credible because it elevates dubious or unsubstantiated claims beyond their merit, according to Aaron Zitner (2003).

Priest says that the media should always report the existence of contradictory viewpoints over scientific issues because scientific consensus is not always correct. "If the media always reported the majority view in science as 'correct', the public would be done a serious disservice" (Salleh, 2003). However, journalists should clearly identify which views are held in higher regard by the scientific community (House of Lords, 2000). Furthermore, when uncertainty surrounds a scientific issue, reporters should not make the assumption that all views, no matter how unorthodox, have the same legitimacy.

Nelkin also comments that science reporting tends to be less critical or sceptical than, for example, political reporting. An attitude of awe and admiration tends to infiltrate scientific reporting.

The House of Lords Report (2000) warns against this lack of scepticism in its science reporting guideline to editors. It recommends that:

- Journalists make every effort to establish the credibility of scientists and their work
- Journalists be encouraged to treat with healthy scepticism work that has not been approved through the process of peer review, whereby articles are only published once scrutinised by experts in the field.

Both the journalistic standard of objectivity and lack of scepticism have influenced the reporting of cloning, apparent from the coverage given to people such as Brigitte Boisselier and Severino Antinori.

In covering these individuals' ongoing claims of successful human cloning, journalists "could – and should – have done much better for news consumers" (Zitner, 2003: 27).

Zitner (2003) admits that the usual standard for determining if a scientific claim is valid and newsworthy is its publication in a peer-reviewed journal. But, he claims that this standard seemed "too fastidious" for the human cloning story as publication was very unlikely from the likes of Boisselier and Antinori.

Nevertheless, by stating their intent to clone humans, they had touched off an ethical and public policy debate that was, in itself, newsworthy (Hall 2003).

Zitner (2003), however, feels that “too often our stories seemed to lack any standards at all”. Despite providing any evidence of expertise, experiments, or success Boisselier and Antinori were given significant press coverage. There was not enough scepticism and “when we did challenge their claims, reporters fell into a simplistic is-not, is-too style of reporting that gave equal footing to the “cloners” and their better-credentialed doubters” (Zitner, 2003, 26).

“While the accounts were sceptical, they were politely so, and more attention was focused on the intent of the would-be cloners than on a clear-eyed assessment of their chances of success” (Hall, 2003: 14). Science is thus misrepresented.

Zitner admits that there has been a lot of good reporting on the issue, particularly when journalists draw from the approach of political reporting. By providing background information on Clonaid and its history of publicity stunts, for example, healthy scepticism and genuine objectivity were added to reports on their announcement of the first cloned human baby.

Similarly, Munro (2003) notes that journalists often fail to explore the commercial interests of scientists in public debate. This is particularly relevant with regard to reporting on stem cells. In many cases medical researchers arguing for the freedom to use human embryonic stem cells have major interests in companies involved in stem cell research.

“Asking the familiar questions about personality, motives and finances will provide stronger stories and provide the kind of transparency news consumers deserve,” concludes Zitner (2003: 27).

Apart from the inherent nature of science journalism, constraints implemented through editorial practices affect the work of all reporters – but in particular science journalists who are required to provide accurate reports on “complex, uncertain and often slowly evolving events” (Nelkin, 1995: 104).

So-called news work constraints include those of time, finance, space, and sources.

Journalists are required to write stories rapidly to meet pressing deadlines. These time constraints encourage focus on “breaking news” while discouraging coverage of long-term issues or those involving elaborate background research (Nelkin, 1995).

Consequentially, science is covered as a series of dramatic events – a tendency also noted by Nisbet and Lewenstein (2001).

The results are detrimental to the accurate reporting of science. In contrast with the media's focus on breakthroughs, "science is slow, patient, precise, careful, conservative and complicated," notes Kathy Sawyer of *The Washington Post* (Stein, 1998: 58). By its nature, the work of most scientists proceeds by degrees, step-by-step, rather than in major breakthrough leaps (Stein, 1998).

Although media coverage fades after the initial news, long-term consequences are often important to determine the actual value or significance of the original news. According to Wilkie and Graham (2001: 148) "there can be a lengthy time lag between *reporting* the event and *understanding* what is going on and thus being able to put it in its proper context".

The analysis of scientific methods and processes is limited with the focus on 'breaking news'. Equally important in assessing the significance of the research, the processes themselves are not considered newsworthy (Nelkin, 1995).

In addition to the time constraints, science journalism also faces financial constraints (Nelkin, 1995). In South Africa, newspapers prefer to hire general reporters who cover several beats rather than dedicated science writers (Van Rooyen, 2002).

Space constraints have an influence on accurate science reporting as well. Competition for space limits the opportunity to include the background material and qualifications needed to provide accurate reporting on complex issues (Nelkin, 1995). Consequently Rees and Fitzpatrick (1999) believe that the place of science is in feature articles rather than news. "Science generally only earns a newspaper headline as background rather than as a story in its own right. Indeed, coverage restricted to 'newsworthy' items – newly announced results that carry a crisp and easily summarisable message – can't avoid distorting how science develops" (Rees).

Deadlines limit the number of sources a reporter can use. Deadlines also influence the choice of source, with journalists more likely to approach those parties providing well-packaged and easily-understandable information. These sources are usually PR associated and likely to influence the shape of the news to their own advantage.

For example, critical analysis of Dolly's birth was often limited to one line quotes "from 'experts' who sometimes seemed more notable for their availability than their good sense" (Griffin, 1997).

The combined effect of these news work constraints is apparent from the reporting of Advanced Cell Technology's (ACT) 2001 announcement of a breakthrough. The events are outlined in an article entitled "Breaking news or broken news" (Miller, 2002).

On a Sunday in November 2001, an online journal posted an article from ACT describing a series of experiments that created three embryos derived from somatic cells. The embryos developed up to the six-cell stage. The article concluded that the research marked the first step in creating immune-compatible stem cells. Simultaneously *U.S. News of the World* released an article ("The First Clone") stating that ACT had "successfully engineered the world's first cloned human embryo". On the same day *Scientific American* released an article by 3 ACT researchers. The article itself did not report that they succeeded in producing actual stem cells or in sustaining the divided eggs to 100-cell embryo level. However, the article's title proclaimed "The First Human Embryo Cloned".

Associated Press covered the news, summarising ACT's claims but noting dissent from the scientific community. However the foreign press, in general, repeated ACT's claims but omitted any reservations about its accuracy.

By Monday morning experienced science writers began covering the story and "general interpretation of the first announcement turned nearly 180 degrees". The accuracy of the reported cloning was seriously questioned and it was seriously doubted that the six-celled embryos created could ever develop into a foetus if implanted in a woman's uterus.

By the following day consensus was emerging among science writers that ACT had produced little evidence of a true medical breakthrough. By Friday, reporting had turned from the ACT claim to questioning whether it had warranted the media coverage received.

The article suggests that "speed is often the enemy of accuracy and that the need for expertise in reporting about science – and other equally technical subjects – is compelling" (Miller, 2002: 21).

Science journalism also faces editorial constraints with editors deciding what articles to publish, how the article is cut and where it is placed (Nelkin, 1995). Editors, concerned with attracting readers, evaluate news stories primarily on excitement value rather than accuracy and depth.

Assumptions about the newspaper's audience play a major role in the selection and style of stories (Nelkin, 1995). It is commonly believed that readers are less interested in analytical reports about science events than how the events will affect the reader personally (Wellcome Trust).

To appeal to a perceived public who see science as boring and intimidating (Hartz & Chappell, 1998), writers tend to overestimate the significance of discoveries or results. Said Keith Campbell of the Roslin Institute on coverage of Dolly: "A lot of people were trying to sensationalise it rather than just report what was actually happening" (Kreeger 1997: 1). The focus of articles is placed on drama, controversy and the unusual to make articles more entertaining (Stein, 1998), while complex issues are avoided.

One reason for avoiding complex issues is the belief that the public will not understand them. Another reason is that journalists themselves may struggle to comprehend and, hence, explain the complexities (Nelkin, 1995). According to Palevitz and Lewis (1998: 7) the overwhelming majority of scientists believe that "few members of the news media understand the nature of science and technology, such as the 'tentativeness of most scientific discovery and the complexities of the results.'"

The so-called "constraints of complexities" may result in the omission of relevant information and distortions in the translation of complex terms to general English (Nelkin 1995). Furthermore, a journalist's difficulty in coming to terms with complicated technical material reduces the likelihood of sceptical probing investigation as suggested by Zitner (2003).

The inherent nature and constraints of science journalism as described by Nelkin (1995) and outline above can be seen in the reporting of the stem cell and human cloning issues.

According to Munro (2003: 23) "mainstream media coverage of stem cells and cloning is starry eyed, lopsided and deceptive." Munro compares the reporting on stem cells to that of mid 1990s Internet coverage. Initially, the dot com coverage featured overblown hype, with inflated promises of prosperity. Only when the promise failed to materialise did journalists begin to write cautionary stories and investigative pieces. Munro says that current biotechnology coverage is still in the hype phase. However, following the widespread reports about miracle cures from cloned embryos' stem cells, scientists are now quietly claiming that these cures will not be available for many years. The result of the unfulfilled promises will be public disillusionment and critical reporting.

A similar pattern emerged in the reporting of interferon (Nelkin, 1995). According to Nelkin, these dramatic shifts from hype to disillusionment take place as journalists respond to the initial promotional enthusiasm of technical institutions and then to changing popular fashions.

Munro (2003:25) decries the approach and asks, "Can we, as reporters, not restrain our wildest dreams in favour of accurately describing the limited, but still wonderful, progress that we observe?"

The importance of accurate science reporting is emphasised in Hall's (2003) analysis of the human cloning debate. Says Hall, "the public, and policymakers, have been poorly served by the quality of this important bioethical discussion." One of the reasons for the low quality of the discussion is the lack of attention given to scientific facts. These facts form an integral part of the debate and are required to ensure understanding of the issues involved.

Firstly, Hall says that the media was a little too polite in its coverage of Boisselier's press conference announcing the birth of 'Eve'. Media coverage was also too slow in contextualising and critically assessing the scientific claims.

According to Hall, the scientific claims of cloning and stem cell research are too important to be “misunderstood, misrepresented, or dismissed” by non-scientists (including journalists) and those scientists who advocate too strongly that therapeutic cloning and stem cell therapy will definitely cure human disease.

Nevertheless, says Hall, the first casualty in a debate about science is complexity – and modern biological science is inherently complex. Furthermore, scientific fact and judgement have become increasingly rare in media and public discussions on cloning. “Devaluation of scientific knowledge has long been a feature of the cloning debate” (Hall, 2003: 15).

Hall offers two examples where scientific knowledge has been “devalued”.

Much of the debate over embryonic stem cell research focuses on claims that adult stem cell research promises the same clinical benefits without any of the same ethical considerations. These claims are scientifically based, and have important medical implications, but are supported by very few scientists. The claims attained such a high profile in the debate because one of those very few scientists advised U.S. senators, testified in Congress, and was quoted in numerous media reports.

Although reproductive cloning is widely opposed, it has become rhetorically coupled to therapeutic cloning. Those opposed to cloning argue that therapeutic cloning will inevitably result in reproductive cloning. “But these important moral concerns hinge on scientific distinctions that are either misunderstood or largely ignored” (Hall, 2003: 16).

Unfortunately, as stated previously, reporting on cloning has a dichotomous nature whereby articles either focus on the technical, scientific aspects or on the ethical implications of cloning. However, the science and ethics of the subject are certainly linked, as an understanding of the science involved is required to understand the ethical implications.

Of the two aspects, there seems to have been an increase in the coverage given to the ethical implications of cloning. This is particularly true in the case of media reports on Dolly.

With the increase in ethical implications, there has been an increase in the negative tone of biotechnology articles in the United States press. The South African press has a positive attitude towards science and technology in general. Yet, with specific reference to the reporting of cloning, the British press tend to focus on the associated risks or concern. Coverage following the announcement of Dolly tended to use popular science fiction frames that are inherently negative. However, the positive or negative tone of articles on cloning seems to depend on the publication's agenda although the tone was particularly negative towards reproductive human cloning.

With regard to the scientific explanation of cloning, studies show that it has been somewhat lacking – even though the media play an important role in the education of the public. Neither has the scientific reporting of cloning always been accurate with “genetic essentialism” one of the most common errors with regard to the coverage of cloning. Potential causes of such inaccuracies are the inherent nature of science journalism (“objectivity” and “scepticism”) and the constraints of science journalism.

These issues raised in the literature review will be addressed by my research, the methodology of which is outlined in the following chapter.

## Chapter 5

### Methodology

As detailed in the Introduction, the intention of this research is to investigate how cloning has been reported by the daily newspapers of the Western Cape with specific emphasis on the ethical and scientific aspects of the cloning coverage. The main factors addressed are: whether the coverage focuses on the ethical or scientific aspects of cloning, if cloning is reported in a positive or negative tone, and whether the science of cloning is adequately explained.

As previously stated, I found that, with the exception of the 2003 *Towards a better map* report, the majority of in-depth research on the reporting of cloning has tended to focus on how the Dolly phenomenon was covered in the international media. It has now been six years since the announcement of the sheep's birth. Alternatively, research has focused on the reporting of biotechnology in general rather than specifically addressing the subject of cloning specifically.

Therefore my limited study aims to provide a more up-to-date perspective related to the reporting of cloning, from the perspective of Western Cape daily newspapers, in particular.

So as to be representative of the region, my findings are based on an analysis of articles taken from all the daily newspapers of the Western Cape: *Cape Argus*, *Cape Times* and *Die Burger*. The intention is not to compare the coverage between newspapers but rather to obtain an overview of how cloning is reported in the region as a whole. Although a fourth daily newspaper (*ThisDay*) was launched during the course of 2003, it was not included since its publication coincides with only a short period of the research time frame. Furthermore, it is a national daily not published in the Cape but merely distributed there.

This time frame was initially three months, but was extended to a twelve-month period so as to obtain a more representative sample featuring an adequate number of articles. Sample size is an important aspect of research according to Cohn and Cope (2001), who cite the so-called "Law of Large Numbers". According to this law, as the number of items researched increases, the probable truth of a conclusion increases. The twelve-month period began on 10 November 2002 and ended on 10

November 2003. The sole reason for this starting date is that it marks the day that the *Cape Argus* began archiving articles on its web site.

Each newspaper's web site was used to retrieve the articles. Each site features an online search function:

- <http://www.capeargus.co.za/index.php?fSectionId=176>
- <http://www.capetimes.co.za/index.php?fSectionId=320>
- <http://152.111.1.251/cgi-bin/dieburger.cgi>

Time and resource constraints necessitated the use of these online databases, which enable quick searches for specific words or phrases. Another benefit is that the search function is able to find these words regardless of where they appear in the article, thus reducing the chance of relevant articles being missed – as may occur during the manual scanning of newspapers.

However, it must be noted that the use of the online databases poses two potential problems. The possibility exists that not all articles from the printed newspapers are transferred to the online database, thus resulting in certain articles being overlooked by this research. Furthermore, it is possible that certain articles on cloning do not feature any of the keywords chosen. Again, as a result, there may be articles that have been omitted.

For the *Cape Times* and *Cape Argus* the following search terms were used: 'clone', 'cloning', and 'cloned'. When searching *Die Burger* online archives, the following words were used: 'kloning', 'kloon', 'klone', 'gekloon', and 'gekloonde'. Other keywords were used in accordance with the main cloning stories of the time frame: Clonaid's announcement of Eve's birth, Severino Antinori's similar announcement in November 2002, the death of Dolly, and the birth of Futhi, a cloned calf in South Africa. The keywords used, for both languages, were: 'Rael', 'Clonaid', 'Antinori', 'Dolly', and 'Futhi'.

Articles retrieved but not included in the final analysis were letters from readers and reports where the term "cloning" was used in a non-scientific context. An example of the latter includes an article about the use of cloned (illegally copied) licence plates in London. Also excluded were articles taken from the Eastern Cape edition of *Die Burger*, which are also listed when the newspaper's database is searched.

In order to measure the content of these articles I used a technique known as quantitative content analysis – a “research technique for making replicable and valid inferences from data to their context” (Krippendorff, 1980: 6).

Variables within the text of news articles are assigned numeric values according to measurement rules. The relationships between these numeric values are then analysed with statistical techniques to describe the content of the news articles (Krippendorff, 1980). A strength of quantitative content analysis is therefore that its results are replicable so that other researchers applying the same methods should reach the same conclusions (Nisbet & Lewenstein, 2001). Other strengths of the technique include its ability to compare large volumes of text, and keep subjectivity to a minimum (Mouton, 2001).

However, subjectivity may pose a problem if multiple coders are used. All content analysis involves the development of coding schemas and, according to Mouton, a main source of error is the inter-rater reliability where more than one coder is involved. Since I have been responsible for all the coding, this potential threat has been minimised.

Another limitation of quantitative content analysis is the representativeness of the texts that are analysed, which limits the external validity of the findings. It is therefore important to reiterate that my research is only intended to represent the coverage of cloning in the Western Cape daily newspapers and that my findings may not be relevant to other countries or even other regions within South Africa.

To address the three areas of focus outlined in the literature review, I adapted measurement rules from a variety of previous studies relating to the coverage of science, biotechnology and cloning in the media.

## **5.1 Science or ethics**

In order to determine whether the articles focused on the scientific or ethical aspects of cloning, definitions were derived for each aspect:

- Science: description and/or explanation of the scientific processes involved; attention to the role of scientists; significance of the research. I carefully

created this definition myself as no suitable alternative could be found in previous research.

- Ethics: ethical principles; thresholds; boundaries; distinctions between acceptable or unacceptable risks in discussions on known risks; dilemmas (Nisbet & Lewenstein, 2001).

Based on the number of words dedicated to each aspect, articles were grouped into one of four categories: 'science', 'ethics', 'both', or 'neutral'. 'Neutral' articles were those that did not refer to either science or ethics. Examples included straightforward reports on what Brigitte Boisselier stated when announcing the birth of Eve, and reports on United Nations voting with regard to human cloning experiments.

## 5.2 Positive or negative tone

To determine whether articles had a positive or negative tone towards cloning (evaluative tone), I used the "degree of negativism" variable from Van Rooyen's 2002 South African study. According to this variable, articles are classified as either 'negative' (described as "a discourse of criticism") or 'positive' ("a discourse of promise"). I have added a 'neutral' classification to allow for articles that do not fall into either category.

Related to the evaluative tone is the discourse of benefits and risks. Also taken from Van Rooyen's study, this discourse was monitored by grouping articles into the following categories: 'only benefits', 'mostly benefits', 'only risks', 'mostly risks', 'equal proportions of benefits and risks' and 'not in question'.

The presence of science fiction-based frames, conveying negative connotations about cloning, has been well documented in the coverage during the late 1990s. To investigate whether these frames are still being used, articles were analysed to see whether they used images, metaphors, similes or analogies relating to texts such as *Frankenstein*, *Brave New World* or *The Boys from Brazil*.

## 5.3 Explanation of science

To evaluate whether the actual science of cloning has been explained in the newspaper articles, a variable from the *Towards a better map* report was used.

'Science Explicitly Explained' represents instances where newspapers have dedicated more than one sentence to explaining the science associated with cloning.

I also looked at one of the so-called constraints of scientific reporting (Nelkin, 1995) which potentially have a negative influence on the reporting of science. The focus on breaking news (as a result of news work constraints) was determined by using the classification of stories as 'breaking news' or 'feature' stories as based on Van Rooyen's research. Breaking news stories were identified by their current value and their use of the 'inverted pyramid' structure – where the 'who, what, when, where, why and how' aspects of the cloning story were featured most prominently. Feature stories were recognised by their longer format containing a more detailed analysis of the issue.

I also noted the date of each individual article to determine whether there was an emphasis on breaking news. Nisbet & Lewenstein (2002) used this strategy to determine whether scientific reporting was sustained, allowing readers to follow the ongoing developments that characterise science, or highly episodic.

In summary, I used quantitative content analysis to study reports on cloning in three daily newspapers of the Western Cape (*Cape Argus*, *Cape Times* and *Die Burger*) during the period of one year from 10 November 2002 to 10 November 2003. The intention was to investigate whether more emphasis is placed on cloning's ethical or scientific aspects, if the coverage of cloning features a positive or negative tone, and whether the science associated with cloning is explicitly explained.

## Chapter 6

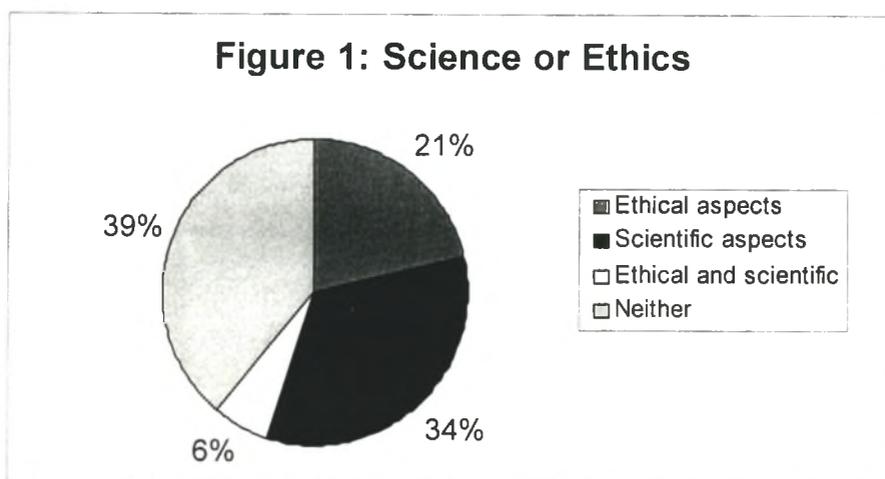
### Results

The search of the online newspaper databases yielded 69 articles on cloning for the period from 10 November 2002 to 10 November 2003. Although this number was lower than desirable, it is in itself indicative of the small number of science and technology articles in the South African media (Van Rooyen, 2002). Van Rooyen's research found that of the editorial content studied during a three-month period, only 1,8% was dedicated to science and technology.

The low number of articles analysed may considerably reduce the significance and external validity of the findings listed below. It may also have resulted in the small differences between opposing variables so that the general findings are not emphatically positive or negative, but tend to be more neutral (Cohn & Cope, 2001).

#### 6.1 Science or ethics

Overall, slightly more articles tended to focus on the scientific aspects of cloning (34%) than on the ethical aspects (21%). Only 6% of articles focused on both aspects, while the largest number (39%) did not focus on either science or ethics. (See figure 1).

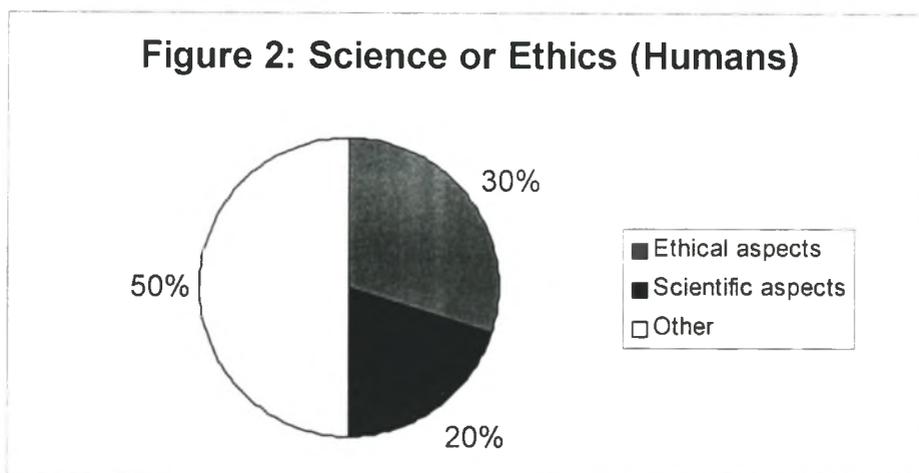


This finding that there is a greater emphasis on the scientific aspect contradicts the research examined in the literature review, which tended to emphasise the ethical aspects. As previously mentioned, the majority of articles in the literature review

focused on the reporting of Dolly. With the announcement of the sheep's birth, the majority of journalists quickly moved the story from the cloning of animals to that of humans. This resulted in articles that focused on the ethical aspects of human cloning rather than on the actual cloning of a sheep (Wilkie & Graham, 2001). This potentially skewed the coverage towards an emphasis on ethics.

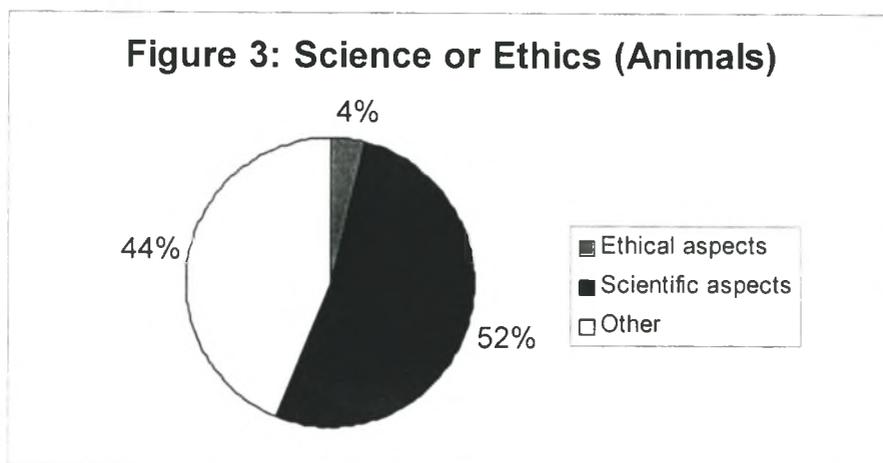
However, it should be noted that, while Nisbet and Lewenstein (2002) recorded an increase in the ethical nature of science reporting post-Dolly, they do not state whether there was an overall emphasis on science or ethics. As no previous study on the coverage of cloning or the ethical nature of science reporting in a South African context seems to exist, there is no base line with which to compare in determining whether there has been an increase of the ethical component in news coverage.

When looking specifically at articles dealing with human cloning, my study found that there is still a greater emphasis on the ethical aspects (30%) than on the scientific aspects (20%). This suggests that articles on human cloning still tend to focus on the ethics of the subject. (See figure 2. 'Other' is a combination of 'science and ethics' and 'neither'.)



However, the articles from the sample that deal exclusively with animal cloning tend to focus overwhelmingly on the science (52%). Only 4% of articles on animal cloning focus on ethics (relating to humans or animals). (See figure 3). It is therefore possible that journalists are now less likely to make the jump from animal cloning to human cloning. There seems to be a clear distinction between the two areas, and articles on animal cloning are seemingly no longer a stepping-stone for discussions on the

ethics of human cloning. A notable exception is the opinion piece “In Whose Image?” from the 9 May edition of the *Cape Argus*. It states, “At present human cloning is forbidden in this country and elsewhere. But sooner or later it is likely that the process will move beyond Dolly the Sheep (the world's first cloned animal) and Futhi the Calf.”



The fact that so few articles on animal cloning focused on ethics influenced my finding that, overall, there is more emphasis on the science of cloning.

In keeping with the overall results, it is important to note that the majority of articles (39%) did not focus on either ethics or science. A possible explanation is that a large number of articles falling within the timeframe dealt with neutral issues such as the proposed court cases involving Clonaid and the parents of the first cloned baby, and the resignation of former ABC News science journalist Michael Guellin as an independent observer of Clonaid's work. The large number of neutral articles may also be the result of an inadequate definition for the 'science' variable. Although I put much thought and research into defining the variable, it was not wholly based on any existing definition.

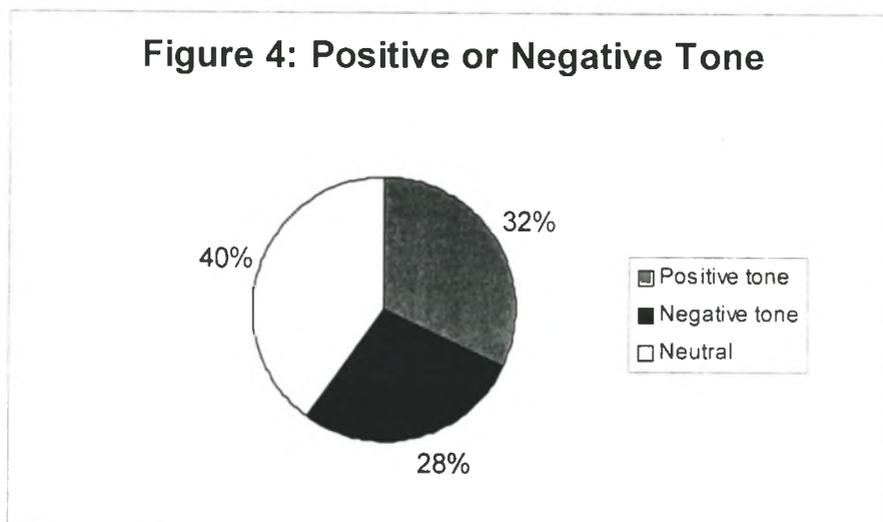
The result that only 6% of articles focused on both the ethics and science of cloning confirms the findings by the *Towards a better map* study that “reports tend to be scientifically technical, or else avoid all mention of science and concentrate on the ethical aspect of genetic medical research” (Hargreaves et al., 2003: 27). A case in point is “Wat is kloning en klone”, a simple explanation of cloning by Thinus Ferreira in *Die Burger* of 20 May 2003. Although the article is clearly intended as a basic

introduction to cloning, it focuses exclusively on the science of the subject and makes no mention whatsoever of the related ethical issues.

## 6.2 Positive or negative tone

The findings relating to the overall attitude of articles towards cloning show a similar broad distribution to those for science and ethics. While the overall results do not reveal particularly conclusive findings, potentially more revealing results are found when focusing specifically on human cloning articles or those on animal cloning.

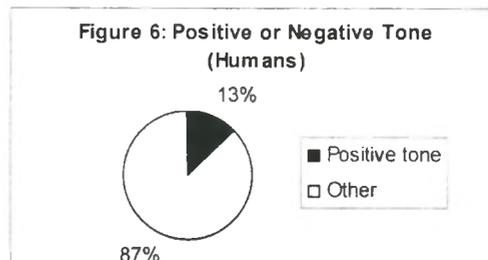
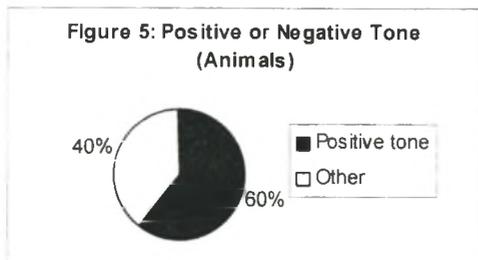
Overall, the evaluative tone of the coverage was slightly more positive (32%) than negative (28%) in the sample of articles. Once again the largest number of articles were defined as 'neutral' (40%). (See figure 4).



The finding that coverage is more positive (albeit slightly) supports the results of research in South Africa (Van Rooyen, 2002) and the United States (Nisbet & Lewenstein, 2002) as highlighted in the literature review. However, it should be noted that neither of these studies applied to the reporting of cloning specifically and that the *Towards a better map* study, which did focus on cloning, reported a negative attitude in British coverage.

If articles on animal cloning are considered separately to those on human cloning, 60% of animal cloning articles feature positive coverage (figure 5). The focus of these articles was generally on the benefits of the cloning research in terms of possibilities

for breeding and increasing the numbers of endangered animals. The media attention given to Futhi was, in particular, overwhelmingly positive. Once again the exception was “In Whose Image” from the *Cape Argus* which focused on the potential for human cloning and concluded that humanity “still has some way to go in ensuring that a new evil does not emerge.”



When considering the articles on human cloning independently, only 13% of the reports analysed were positive (figure 6). All these reports related to therapeutic cloning. Examples of such reports include “Stem cells could help people with spinal injuries start walking again” from the 4 July edition of the *Cape Times*. The feature article “Is baba Eve 'n versinsel?” from *Die Burger* of 9 January 2003, encapsulates the contrasting attitudes towards human reproductive and therapeutic cloning. Human reproductive cloning is portrayed as a danger that should be avoided (negative tone), while therapeutic cloning is portrayed in a beneficial light (positive tone).

Of the five articles on therapeutic cloning in the sample, three (60%) featured a positive tone, highlighting the potential benefits of the research. This seems to imply that the Western Cape newspapers have a positive attitude towards therapeutic cloning. However, with the very small sample size (five articles on therapeutic cloning), the significance of this finding should not be overestimated.

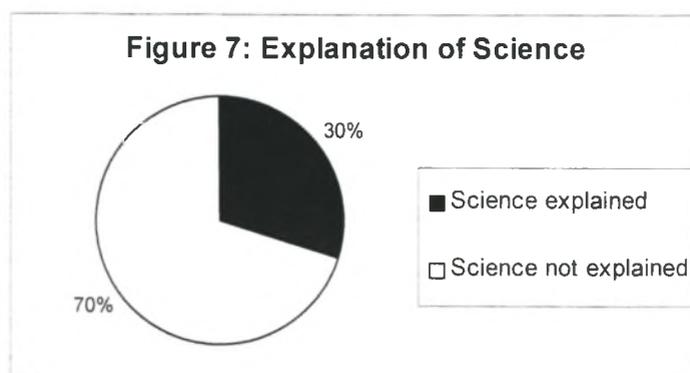
The large number of so-called neutral articles can potentially once again be attributed to the sizable proportion of articles simply providing facts on subjects such as the proposed criminal trials following Clonaid's announcement. These articles featured an inverted pyramid structure and did not go beyond reporting the immediate facts at hand. These facts were not even presented in such a way as to place the subject in a positive or negative light.

There were also a large number of short articles (less than 100 words) that simply made announcements such as “miniature pig cloned”. These too had no evaluative tone.

In terms of science fiction frames, which were well used in post-Dolly reports and usually conveyed a negative tone towards cloning (Nerlich et al, 2000), I found that only 4% of articles used these frames. The articles that did mention science fiction themes, generally did so in a light-hearted, non-threatening or educational manner. Len Ashton’s “Be very afraid if Madame Boisselier ever gets her teeth into cloning droves of Kortbroeks” in the 31 December 2002 edition of the *Cape Times* is a very tongue in cheek look at the possibilities of famous people, including politicians, cloning themselves. Ferreira’s “Wat is kloning en klone” begins as follows “Met alles wat al oor kloning geskryf is, klink dit soos iets uit *Pokemon* of *Star Wars*, maar dit is nie regtig so nie.” (With everything that has already been written about cloning, it sounds like something out of *Pokemon* or *Star Wars*, but it isn’t really so.) However, the introductory summary of “Is baba Eve 'n versinsel?” does question whether the baby looks normal or is a small Frankenstein, although the article itself makes no mention of science fiction symbols.

### **6.3 Explanation of science**

A minority (30%) of the articles analysed explicitly explained the science of cloning. The remaining 70% of articles did not feature even a single sentence explaining the science of cloning. (See figure 7). This finding corresponds with that of the *Towards a better map* study, which found that the scientific context is often missing from newspaper reports about cloning. However, my findings indicate that the explanation of science is slightly more prevalent in the newspapers of the Western Cape. Six of the eight newspapers analysed during the *Towards a better map* research explained the science of cloning or genetic medical research in less than 10% of their articles.

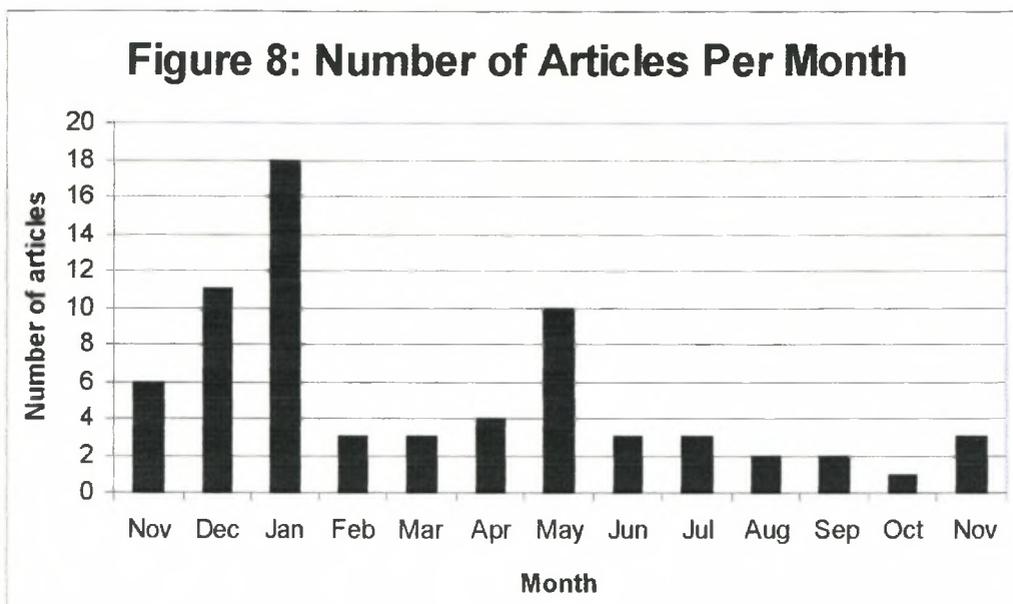


With regard to the explanation of science, there are a few articles worth mentioning. As stated above, "Wat is kloning en klone" provided readers with an introduction to the basic science of cloning. "Genetiese klone nie werklik identities" is a concerted effort to dispel the beliefs about genetic essentialism. In fact, only one article of those analysed used the concept of genetic essentialism: the humour of "Be very afraid if Madame Boisselier ever gets her teeth into cloning droves of Kortbroeks" is based entirely on the assumption that a person is merely the product of their genetic code and that other factors such as environment do not play a role in the development of personality.

In terms of the constraints of scientific reporting, my research found that there was an emphasis on breaking news – associated with the constraint of news work.

I found that 83% of articles qualified as 'breaking news'. This corresponds with Van Rooyen's finding that the print media generally published more news (74%) than feature stories (26%).

The number of articles on cloning increased during months when there was a major announcement or breakthrough with regards to cloning. The highest number of articles on cloning during the twelve-month period were found in December 2002, January 2003 and May 2003 (figure 8). These months corresponded with Clonaid's announcement that it had cloned a human (December and January) and the birth of Futhi (May).



The coverage of individual events corresponds with the findings of Nisbet and Lewenstein (2002) who found the reporting of science to be highly episodic and focused on major events. They found that the press had not followed the growth in the biotechnology industry, nor followed the general growth in research. As a result Nisbet and Lewenstein (2002) question whether the media has provided accurate reporting of biotechnology-related developments.

Although my finding corresponds with the episodic nature of science reporting as noted by Nisbet and Lewenstein (2002), I cannot pretend to have reached the same conclusion as the authors. A long term study of science reporting throughout South Africa would be required before we can know whether the local press has followed the growth of the biotechnology industry, or question whether the South African media have provided accurate biotechnology reporting.

To summarise my results for the period of 10 November 2002 to 10 November 2003, it may be beneficial to re-address the three main questions conveying the scope of this mini-thesis:

- Does the coverage focus on the ethical or scientific aspects of cloning?

My findings show that the overall coverage of cloning in *Die Burger*, *Cape Times* and *Cape Argus* tended to focus on the scientific aspect. However, articles covering cloning in humans emphasised the ethical aspect, while articles on animal cloning

had a scientific focus. There were a large number of neutral articles where neither scientific nor ethical issues were addressed.

- Is cloning reported in a positive or negative light?

Overall coverage of cloning tended to be slightly more positive than negative. The difference, however, was minimal. Potentially more significant findings were attained when a distinction was made between animal and human cloning articles. Animal cloning articles were largely positive, while human cloning articles were overwhelmingly negative. The only positive articles on human cloning were those that dealt with therapeutic cloning.

- Is the science of cloning adequately explained?

The science of cloning was not adequately explained in the majority of articles analysed. There was an emphasis on breaking news and episodic coverage which potentially has a negative influence on the explanation of science.

In the conclusion which follows I will highlight the most pertinent points of this study by combining these findings with a summary of the literature review and relevant background information.

## Chapter 7

### Conclusion

Cloning is a topic that has long fascinated people (Kolata, 1998). It has imbedded itself into popular culture, being featured in novels such as *Brave New World* and *The Boys from Brazil*. Yet, studies show that the general public has, at best, only a vague understanding of what cloning entails (Wellcome Trust). Alternatively, their perception has been skewed by the way in which the issue has been dealt with in popular culture, presenting alarmist views of so-called cookie cutter humans made to order (Nerlich et al., 2000).

However, cloning is a complex scientific subject that has considerable ethical implications. "It is the kind of topic that people in a deliberate democracy should know about" (Hargreaves et al., 2003:11). People should be made aware of the associated ethical implications so that they are able to make personal judgements and decisions based on their view of the subject (Rensberger, 1997). Yet, it has been suggested that an understanding of the basic science involved in cloning is necessary to understand these implications (Hargreaves et al., 2003).

The media play an important role in the education of the public with regards to science and technology. After formal education ends, the media are, for many people, the main source of information on the latest scientific developments, which include cloning. However, the media have the potential to do more than provide the basic facts. In fact, the media can play an important role in influencing the actions and opinions of the public (Nisbet & Lewenstein, 2001). It could therefore be considered a responsibility of the media to provide accurate information on scientific developments (House of Lords).

The aim of this mini-thesis was to investigate how one of these developments, cloning, was reported by three daily newspapers of the Western Cape during a period from November 2002 to November 2003. Specific attention was paid to whether the articles emphasised the scientific or ethical aspects of cloning, featured a positive or negative tone, and explained the associated science.

My literature review was designed to address each of these aspects and found that, in the late 1990s there had been an increase in the ethical nature of biotechnology

reporting. This was attributed to the announcement of Dolly the cloned sheep in 1997 with media reports discussing the ethical implications of cloning humans – even though this had not been achieved. Despite the increased attention awarded the ethical aspects, a recent British study found that the majority of articles on cloning either focused on the scientific or ethical component of the story – even though, as noted above, an understanding of the science is required to comprehend the ethical implications.

In my quantitative content analysis of 69 articles from the *Cape Argus*, *Cape Times* and *Die Burger*, I found that, overall, slightly more articles tended to focus on the scientific than the ethical aspects of cloning. However, the largest number of articles did not focus on either the science or ethics. The articles solely addressing human cloning (which includes therapeutic cloning) were more likely to focus on the ethical aspects. A possible suggestion is that an ongoing ethical debate still surrounds the issue.

The majority of articles dealing only with animal cloning, focussed on the scientific aspect. A possible suggestion is that the ethics of animal cloning are not seen as particularly important, or that it is becoming a more acceptable procedure. Alternatively, animal cloning is now possibly seen as distinct from the cloning of humans. Journalists are therefore potentially less likely to shift the emphasis of the story to human cloning and its ethical implications.

As in Britain, a minority of articles focused on both science and ethics.

With regard to article tone, a study of South African media found that there was a positive tone with regard to the reporting of science and technology in general. While the United States historically also featured a positive tone, there was an increase in the negative tone of biotechnology articles – once again associated with Dolly's birth. The British media, in turn, tended to favour an emphasis on reporting risks when reporting on cloning. The trends in Britain and the United States were prevalent in the post-Dolly coverage, which – apart from focusing on ethics – featured a negative tone. This tone was particularly prevalent in reports on human reproductive cloning although, generally, the tone was determined by the nature and agenda of the publication.

My research found that the evaluative tone of the sampled articles was slightly more positive than negative. However, the difference between the two variables was very small, making it difficult to draw a conclusion from the result. Nevertheless, articles that dealt exclusively with human cloning were found to be negative, possibly suggesting that the three newspapers analysed have a negative attitude towards human cloning. It is worth mentioning though that most articles dealing with human therapeutic cloning were found to have a positive tone, although no implications should be made due to the very small sample size.

Articles dealing with animal cloning were significantly positive.

Articles dealing with the cloning of animals therefore tended to have a positive tone and emphasised the scientific aspect of cloning. In contrast, articles that dealt with human cloning featured a negative tone and emphasised the ethical aspect of the subject.

In terms of the explanation of science, my literature review found that the scientific context is frequently omitted from British newspaper articles on cloning and that the majority did not define stem cells – a specific term associated with cloning.

Furthermore, the reporting of cloning has not always been accurate, and although various misconceptions have been reported, “genetic essentialism” is one of the most common errors. Potential causes of these errors are the so-called constraints of science journalism (Nelkin, 1995), which, for example, result in a focus on breakthrough events and coverage that is episodic rather than sustained.

My study found, that like the British *Towards a better map* study, science was explained in a minority of articles. However, genetic essentialism was used in the vast minority of articles, possibly suggesting that journalists have become more learned on the subject of cloning.

With regard to the constraints of science journalism, my study found that the majority of articles tended to address breakthrough events and that there was a tendency for episodic coverage.

Before proceeding to the possible implications of my findings, the large number of ‘neutral’ results must be noted. When determining whether the articles emphasised

science or ethics, the majority were found to emphasise neither. A similar 'neutral' result was achieved with regards to the tone of the articles. It is not clear whether the 'neutral' results were caused by a flaw in my research design or by a large number of articles that simply reported facts which could not be construed as being either scientific, ethical, positive or negative.

If this large number of 'neutral' findings is not the result of a research flaw, there are potential implications. In terms of the emphasis on science or ethics, a possible implication is that the media are not adequately using the opportunity to inform readers of either the scientific or ethical aspects of cloning. The large number of articles that have a neutral tone could imply that the media are not willing to pass judgement on the issue and wish to provide completely impartial coverage.

In terms of animal cloning, the generally positive tone can be attributed to two factors. There is the possibility that the media are providing readers with the consensus view of the scientific community that animal cloning has potential benefits. There is also the possibility that the media-perceived public opinion plays a role in what is reported. This could imply that the media believe the public already have a positive outlook towards animal cloning.

The same argument applies to the negative tone awarded to human cloning articles specifically.

In terms of the explanation of science, the small number of articles reporting on both science and ethics might contribute to a public misunderstanding of cloning issues, particularly since it is important to understand the science in order to comprehend the ethical implications.

Also potentially contributing to a public misunderstanding is the small number of articles on the whole, as well as the emphasis on short, breaking news articles. These short articles are not able to explain the intricacies and nuances associated with science. Furthermore, the isolated, episodic nature of the reports on cloning could fail to give readers an accurate overview of the issue as it develops.

Possibly most important in terms of public understanding is that the majority of articles fail to explain the science associated with the process.

However, there may be very little significance or external validity to my results and the implications noted above.

My research was very limited, featuring a very small sample size, which decreases the legitimacy and accuracy of the results. Furthermore, the study is limited to a very specific time frame, geographic region, and certain type of publication.

As a result of the potentially small external validity of my study, it may have been more beneficial to employ a qualitative research technique that would possibly have provided more in-depth and detailed analyses of the specific Western Cape newspapers. These findings could potentially have been more beneficial to the journalists working at the analysed publications.

A related shortcoming of the quantitative content analysis technique chosen is that with it there “remains some degree of uncertainty regarding the actual inputs to the process or the specifics of the process itself” (Nisbet & Lewenstein, 2001). In other words, there was no input from the journalists responsible for the articles.

The small number of articles studied with the technique chosen could also have caused the lack of definite, emphatic results with regards to my general findings. This refers specifically to the small overall difference between positive and negative tone. However, as noted, results were more defined when looking independently at articles on animal and human cloning. It may therefore have been beneficial to make a greater distinction between animal and human cloning articles.

It is, however, also possible that poorly defined variables may have resulted in the lack of well-defined results.

Another potential shortcoming is that my research focused on the media without much consideration for the other role players in the reporting of science – the providers of information (scientists) and eventual recipients of that information (the public).

Finally, there may be flaws in my literature review. The majority of research articles found dealt mainly with the coverage of an event from six years ago. In that time attitudes may have changed and it may be incorrect to draw comparisons between the present and those events. In a similar vein, many of the in-depth studies

consulted referred to the reporting of science and technology or biotechnology in general, rather than that of cloning. Although my study emphasised those portions directly related to cloning, it may not always be possible, or accurate, to draw comparisons.

In order to address these weaknesses of my own study I make a few suggestions for future research into the coverage of cloning.

Similar research could be applied to a larger geographic area or an increased number of publications so as to obtain findings that are more statistically significant and have greater external validity. This research should make clear distinctions between animal and human cloning, or reproductive and therapeutic human cloning, so as to avoid the blurring of the tone variable outlined above. The possible addition of a variable determining whether ethics are “accurately explained” could determine whether, and how well, the media was informing the public of the ethical implications of cloning.

Alternatively, my research could be repeated as a qualitative, rather than quantitative, study.

On a more elaborate level, a long-term survey, like that of Nisbet and Lewenstein, would be able to determine trends in the coverage of cloning in the South African media. It would, for example, be able to determine whether there has been a change in the attitude and nature of press coverage. For example, are animal and therapeutic cloning presented in a more positive light than they were six years ago? Has there been a gradual decrease in the scientific explanation of cloning because journalists assume the public knows the facts by now? There is the potential to combine this study with a survey of public understanding of cloning (like the *Towards a better map* study), which could be an indication of whether the media have done a good job in explaining the subject.

Alternatively, a survey of the general public’s attitudes towards and understanding of cloning could be done, in a similar manner to the ‘Wellcome Trust’ study on attitudes to human cloning. The South African Agency for Science and Technology Advancement (SAATSA) has already performed a public survey of attitudes towards genetic engineering.

It would be interesting to compare the coverage given to Dolly in the South African press to the coverage of Futhi six years later. This comparison may highlight any changes in the emphasis or approach of articles. For example, it would prove or disprove my suggestion that reporting on the cloning of animals no longer seems to be a stepping stone for reports on the ethics and dangers of human cloning. It would also show whether the overall positive tone awarded to coverage on Futhi was present in the coverage of a scientifically more significant announcement (the creation of Dolly).

Alternatively, by analysing the coverage of Futhi's creation with respect to the scientists involved in the cloning work, the journalists who covered the story, and the public who read about it in the newspaper. The scientists could evaluate the coverage, providing their opinion on how the media dealt with the event. The journalists, in turn, could comment on their experiences in dealing with the scientists. Were the scientists, for example, approachable and were they able to explain the science and implications of their work? Public knowledge of the event could then be gauged to determine whether the story did in fact reach the intended audience and whether this audience was able to understand the significance. This study would allow for an integrated view of the main interest groups involved and ensure that the media was not treated as an island, completely separated from its sources and audience.

In a similar vein but on a smaller scale, the relationship between reporters involved in science and technology coverage and South African cloning scientists could be investigated. Once again this would determine the relationship between journalists and scientists, but unlike the similar 'Worlds apart' study would be specific to the coverage of cloning in South Africa.

## References

- Adler, J. & Hager, M. (1993). Clone hype. *Newsweek*, 11 Aug. 1993: 60-62.
- Ashton, L. (2002, December). Be very afraid if Madame Boisselier ever gets her teeth into cloning droves of Kortbroeks. *Cape Times* [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web: <http://www.capetimes.co.za/index.php?fSectionId=273&fArticleId=32518>.
- Barratt, H. & Jackson, T. (2001). Scions made simple. *BMJ: British Medical Journal*, 323(7309): 406.
- Blond, O. (2002). How does the European press address cloning? *Nieman Reports*, 56(3): 21-22.
- Bruce, D. Polly, Dolly, Megan, and Morag: A view from Edinburgh on cloning and genetic engineering. *Techné: Journal of the Society for Philosophy and Technology* [Online]. Retrieved 16 April 2003 from the World Wide Web: <http://scholar.lib.vt.edu/ejournals/SPT/v3n2/BRUCE.html>.
- Byrne, J. & Gurdon, J. (2002). Commentary on human cloning. *Differentiation*, 6(9): 154–157.
- Cohn, V. & Cope, L. (2001). *News & numbers. A guide to reporting statistical claims and controversies in health and other fields*. Ames: Iowa State Press.
- Cogle, C., Guthrie, S., Sanders, R. & Allen, W. (2003). An overview of stem cell research and regulatory issues. *Mayo Clinic Proceedings*, 78(8): 993.
- Conn, P. (1998). Communicating to the public: Make science relevant, human, and clear. *The Scientist*, 12(15): 9.
- Controlling cloning. (2003, January 3). *Cape Argus* [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web: <http://capeargus.co.za/index.php?fSectionId=137&fArticleId=33600>.

Ferreira, T. (2003, May). Wat is kloning en klone? *Die Burger*, p. 8 [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web: <http://152.111.1.251/argief/berigte/dieburger/2003/05/20/JB/8OOS/01.html>.

Fitzpatrick, S. (1999). What makes science news newsworthy? *The Scientist*, 13(23): 12.

Freudenrich, C. "How Cloning Works." [Online]. Retrieved 15 April 2003 from the World Wide Web: <http://www.howstuffworks.com/cloning.htm>.

Genetics and Society. "Media coverage" [Online]. Retrieved 3 March 2003 from the World Wide Web: <http://www.genetics-and-society.org/analysis/media/index.html>.

Griffin, H. (1997). Roslin Institute, Edinburgh, Annual Report 96-97 [Online]. Retrieved 12 April 2003 from the World Wide Web: <http://www.roslin.ac.uk/public/01-03-98-dm.html>.

Hall, S. (2003). Eve redux: The public confusion over cloning. *The Hastings Center Report*, 33(3): 11-25.

Hargreaves, I., Lewis J. & Speers, T. (2003). *Towards a better map: Science, the public and the media*. London: Economic and Social Research Council. ([www.esrc.ac.uk/esrccontent/DownloadDocs/Mapdocfinal.pdf](http://www.esrc.ac.uk/esrccontent/DownloadDocs/Mapdocfinal.pdf)).

Hartz, J. & Chappell, R. (1998). *Worlds apart – How the distance between science and journalism threatens America's future*. Nashville: Freedom Forum First Amendment Center.

Hellsten, I. (2000). Dolly: scientific breakthrough or Frankenstein's monster? Journalistic and scientific metaphors of cloning. *Metaphor & Symbol*, 15(4): 32-49.

Holliman, R. "Cloning and the media" [Online]. Retrieved 12 July 2003 from the World Wide Web: <http://students.open.ac.uk/open2net/dramaticscience/cloning/media.htm>.

Hopkins, P. (1998). Bad Copies: How popular media represent cloning as an ethical problem. *Hastings Center Report*, 28( 2): 6-14.

House of Lords. (2000). Select Committee on Science and Technology Third Report. London: United Kingdom Parliament (<http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldsctech/38/3810.htm>).

Huxford, J. (2000). Framing the future: Science fiction frames and the press coverage of cloning. *Continuum: Journal of Media & Cultural Studies*, 14(2): 187-199.

In Whose Image? (2003, 9 May). *Cape Argus* [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web:  
<http://capeargus.co.za/index.php?fSectionId=137&fArticleId=143516>.

Klotzko, A.J. (2001). Voices from Roslin: The creators of Dolly discuss science, ethics, and social responsibility. In A.J. Klotzko (Ed), *The cloning sourcebook* (pp. 3-27). New York, NY: Oxford University Press.

Kolata, G. (1998). *Clone. The road to Dolly and the path ahead*. New York: William Morrow and Company.

Kreeger, K. (1997). Observers give mixed reviews to media's 'Dollymania'. *The Scientist*, 11(8): 1.

Krippendorff, K. (1980). *Content Analysis. An introduction to its methodology*. Beverley Hills: Sage Publications.

Miller, J.D. (2002). Breaking news or broken news. A brief history of the 'first cloned human embryo' story. *Nieman Reports*, 56(3): 18-21.

Mouton, J. (2001). *How to succeed in your Master's and Doctoral Studies. A South African guide and resource book*. Pretoria: Van Schaik Publishers.

Munro, N. (2003). Is stem cell reporting telling the real story? *Nieman Reports*, 57(2): 23-25.

Nelkin, D. (1995). *Selling science: How the press covers science and technology*. New York: W.H. Freeman & Co.

Nelkin, D. & Lindee, M.S. (1995). *The DNA mystique. The gene as a cultural icon*. New York: W.H. Freeman and Company.

Nelkin, D. & Lindee, M.S. (2001). Cloning in the popular imagination. In A.J. Klotzko (Ed), *The cloning sourcebook* (pp. 83-93). New York, NY: Oxford University Press.

Nerlich, B., Clarke, D., Dingwall, R. (2000). Clones and crops: The use of stock characters and word play in two debates about bioengineering. *Metaphor & Symbol*, 15(4): 50-69.

Nisbet, M. & Lewenstein, B. (2001). *Biotechnology, the media, & public perceptions. A comparison of U.S. media coverage of biotechnology with public perceptions of genetic engineering 1995-1999*. Paper Presented to the 2001 International Public Communication of Science and Technology Conference, Geneva, Switzerland, February 1-3.

Nisbet, M. & Lewenstein, B. (2002). Biotechnology and the American media: The policy process and the elite press, 1970-1999. *Science Communication*, 23(4): 259-391.

Oakridge National Library. "Cloning fact sheet" [Online]. Retrieved 10 September 2003 from the World Wide Web:

[http://www.ornl.gov/TechResources/Human\\_Genome/elsi/cloning.html](http://www.ornl.gov/TechResources/Human_Genome/elsi/cloning.html).

Olson, K. "Cloning: Issues, questions and answers." [Online]. Retrieved 12 April 2003 from the World Wide Web: <http://www.fb.com/views/com/clonina.html>.

Palevitz, B. & Lewis, R. (1998). The use and abuse of the "b" word. *The Scientist*, 12(15): 7.

Perlman, D. (1997). Introduction. In D. Bloom & M. Knudson (Eds), *A Field Guide for Science Writers* (pp. 3-6). New York, NY: Oxford University Press.

Pienaar, A. (2003, January). Is baba Eve 'n versinsel? *Die Burger*, p. 9 [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web:

<http://152.111.1.251/argief/berigte/dieburger/2003/01/08/DB/9LDNk/01.html>.

Public Understanding of Biotechnology. "Fact file: Cloning and genetic engineering" [Online]. Retrieved 10 October 2003 from the World Wide Web: <http://www.pub.ac.za/factfile/cloning.html>.

Rees, M. "Science, Communication and the Media". [Online] Retrieved 5 March 2003 from the World Wide Web: <http://absw.org.uk/Rees.htm>.

Rensberger, B.(1997). Covering science for newspapers. In D. Bloom & M. Knudson (Eds), *A Field Guide for Science Writers* (pp. 7-16). New York, NY: Oxford University Press.

Roslin Institute. "Cloning" [Online]. Retrieved 2 October 2003 from the World Wide Web: <http://www.roslin.ac.uk/public/cloning.html>.

Salleh, A. (2003, May 26). Public 'duped' by media on vaccine fear. *ABC Science Online* [Online]. Retrieved 13 June 2003 from the World Wide Web: <http://www.abc.net.au/science/news/stories/s862613.htm>.

Schenk, M.& Sonje, D. (2000). Journalists and genetic engineering. *New Genetics & Society*, 19(3): 67-85.

Silver, L.M. (1998). *Remaking Eden. Cloning, Genetic engineering and the future of humankind?* London: Phoenix.

Stein, M.L. (1998). Are news stories about cloning being distorted? *Editor & Publisher*, 131(16): 58-59.

Stem cells could help people with spinal injuries start walking again. (2003, 4 July). *Cape Times* [Newspaper, selected stories online]. Retrieved 10 October 2003 from the World Wide Web: <http://www.capetimes.co.za/index.php?fSectionId=271&fArticleId=182229>.

Tamarin, R. (1998). Cloning isn't science fiction anymore. In *World Book Science Year 1999* (pp.72-86). Chicago: World Book Inc.

Travis, J. (2001). Dolly was lucky. *Science News*, 20 Oct. 2001: 250.

Turner, L. (1997). The media and the ethics of cloning. *The Chronicle of Higher Education*, 44(5): 4-6.

Van Rooyen, C. (2002) *Report On Science and Technology Coverage in the SA Print Media*. Stellenbosch: Department of Journalism, University of Stellenbosch ([http://www.saasta.ac.za/scicomm/docs/setcoverage\\_printmedia.pdf](http://www.saasta.ac.za/scicomm/docs/setcoverage_printmedia.pdf))

Wellcome Trust Medicine Society Programme. Public perspectives on human cloning. A social research study. (<http://www.wellcome.ac.uk/en/1/awtpubrepcln.html>).

Wilkie, T. & Graham, E. (2001). Power without responsibility: Media portrayals of British science. In A.J. Klotzko (Ed), *The cloning sourcebook* (pp. 135-152). New York, NY: Oxford University Press.

Wilmot, I., Campbell, K. & Tudge, C. (2000). *The second creation. The age of biological control by the scientists who cloned Dolly*. London: Headline Book Publishing.

Winston, R. (1997). The promise of cloning for human medicine. *British Medical Journal* (International edition), 314 (7085): 913-914.

Zitner, A. (2003). Reporting the cloning story: From hype to healthy skepticism. *Nieman Reports*, 57(2): 25-27.