
NOTICE

This article has subsequently been published by the European Intellectual Property Review at [2004] EIPR 59.

Patenting Stem Cells of Human Origin

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Introduction

The European Commission's first report on the implementation of the Directive for the legal protection of biotechnological inventions² indicates that all is not well in the Union.³ The majority of member states had failed to implement the provisions by December 2002, and eight members were referred to the European Court of Justice in July 2003 when further negotiations came to nothing.⁴ Many concerns relate to the uncertainty that surrounds the bioethical aspects of the law, although there is also on-going confusion as to what the Directive can realistically achieve given that its remit is in the field of patents and not in the regulation of science more generally. Even the express aim of the Directive to provide greater legal clarity has been questioned, in particular regarding the morality provisions in Article 6. Notably absent from these provisions is any mention of human stem cells - a subject which has provoked global ethical and legal debate about whether research should take place at all, and if so, how it should

¹ <http://www.law.ed.ac.uk/ahrb/>. This paper was first delivered at the ATRIP Annual Conference, August 2003, Tokyo, Japan. I am grateful to my colleagues Ken Mason, Charlotte Waelde and Catriona Drew who kindly commented on an earlier draft and to Nadine Eriksson-Smith who provided some much need technical assistance. The usual disclaimer applies.

² Directive 98/44/EC, of 6 July 1998, on the legal protection of biotechnological inventions.

³ Report from the Commission to the European Parliament and the Council, Development and Implications of Patent Law in the Field of Biotechnology and Genetic Engineering COM (2002) 545 final, 7 October 2002.

⁴ IP/03/911, 10 July 2003.

be governed. This paper considers the robustness of the current European patent provisions to meet the ethical and legal challenges posed by the prospect of patenting stem cells of human origin, with particular emphasis on embryonic stem cells.

Assessing the impact of the Biotechnology Directive

The European Commission submitted its first annual report on the implementation of the Directive for the legal protection of biotechnological inventions (98/44/EC) on 7 October 2002.⁵ While the Commission was at pains to reiterate the considerable promise of biotechnology and the fundamental economic importance of implementing the law, it could but note with regret that only six member states had transposed the Directive into their national law at that time. This figure has since increased only by one, while the remaining eight member states have now been referred to the European Court of Justice.⁶ The unease with which these member states have regarded the Directive is mirrored in sections of the wider European public, and the Commission has been forced to acknowledge the on-going potential for conflict over contentious issues such as 'patenting life' and experiments on embryos.⁷ These concerns, like those that belie many of the qualms of the errant member states, impact on the so-called moral aspects of the Directive. And while the Commission has expressed general satisfaction with Article 6 - which contains the kernel of the Directive's moral provisions - it has also felt the need to respond to moral and practical developments in two specific areas, namely, (a) the scope to be given to patents related to sequences or partial-sequences of genes isolated from the human body, and (b) the potential patenting of human stem cells and cell lines obtained from them.

These subjects are currently being examined by a Group of Experts appointed by the Commission and drawn from the disciplines of natural sciences, economics and law. The Group will report later this year on the practical and technical aspects of these areas. Its remit does not extend, however, to reproducing ethical conjecture, for this is the rightful function of the European Group on Ethics which has, indeed, already delivered an opinion on the ethical aspects of patenting inventions involving human stem cells.⁸ The needs for this opinion, and for the request to the Group of Experts to examine the technical side of the debate, arise from the

⁵ N. 1 above.

⁶ The eight refractory member states are: Austria, Belgium, France, Germany, Italy, Luxembourg, the Netherlands and Sweden.

⁷ Commission Staff Working Paper, Results of the Public Consultation: Towards a Strategic Vision of Life Sciences and Biotechnology, SEC (2002) 630, 29 May 2002, Part II.C.

⁸ European Group on Ethics in Science and New Technologies, Ethical Aspects of Patenting Inventions Involving Human Stem Cells, Opinion No.16, 17 May 2002.

already noted lack of clarity within the Biotechnology Directive itself about patenting practices concerning human stem cells and related inventions. The fact that the Directive makes no specific mention of this subject matter is not surprising since the possibility of deriving human stem cells from embryos only arose in the year in which the Directive was eventually adopted.⁹ It is this possibility more than any other that has sparked controversy over stem cell research. Animal and adult stem cells have been the subject of research for several decades from which several successful therapies have been developed,¹⁰ but it is the prospect of the use of the embryo, and more particularly for our purposes the patentability of products derived from that use, that has led to the current furore.

Human stem cells: a brief overview

The adult human body is composed of 50 trillion cells of around 200 different kinds, each with a particular function, be it an eye cell, a muscle cell, a blood cell etc. In the beginning, however, it is not so complicated. When human life begins with the union of the sperm and egg there is but one cell: the *zygote*. Over a matter of hours this cell divides and divides again and at this stage the cells that are created have no dedicated function - they are said to be *undifferentiated*. Indeed, within this initial period of division - which lasts no more than 3-4 days - these undifferentiated stem cells are *totipotent*, that is, each has the capacity to become a complete and separate embryo. This quality is soon lost, however, and by days 5-7 the organism has become a *blastocyst* - a ball of around 100 cells each of which is now *pluripotent*, that is, each has the capacity to develop into any of the 200 cell types that make up the human body, but it is no longer possible for them to develop into separate embryos. As time passes, the organism - which we might now wish to call an *embryo* - will continue to grow so long as it is furnished with an appropriate environment and nutrition. These are provided by implantation in the lining of the womb from which a blood supply can be drawn (occurring around day 8 of development). It is arguable that it is not until this point that the organism achieves the potential for 'humanness' - a distinction which is very important in one's consideration of the status of the embryo in the petrie dish. Thereafter, the embryo will continue to develop, with the first signs of a nervous system appearing at days 14-15 (the *primitive streak*). As the embryo grows, its cells slowly become more task-orientated (*differentiated*) and assume their eventual role within the body. While there is no hard and fast rule,

⁹ J.A. Thomson et al. 'Embryonic Stem Cell Lines Derived from Human Blastocysts', (1998) 282 *Science* 1145-1147.

¹⁰ See, for example, the use of haematopoietic (blood forming) stem cells to treat blood disorders and leukaemias, A.L. Lennard and G.H. Jackson, 'Science, Medicine and the Future: Stem Cell Transplantation', (2000) 321 *British Medical Journal* 433-437.

an embryo is generally referred to as a fetus from week eight of its development onwards. Only a handful of embryonic stem cell lines is currently in existence, with the UK announcing its first success as recently as August 2003.¹¹

Stem cells can also be derived from aborted fetal germ cells, that is, the cells that would have become the sperm or egg cells. These germ cells can be cultivated into stem cells in the same way as can occur with embryos. They were first developed in 1998 and they can now be differentiated into an increasingly broad range of cells.¹²

A final and further source of stem cells can be found in adults, but in the main these tend to be multipotent, that is, capable only of differentiating into particular kinds of cell, or progenitor cells, that is, cells that are clearly destined for a particular end but are as yet undifferentiated. This having been said, as has been found with fetal sources, it appears that adult stem cells can also differentiate into a far broader range of cells than was originally thought.¹³

The value of stem cells of whatever origin is two-fold:

1. Stem cells can divide and multiply more or less indefinitely without differentiation
2. Stem cells can be manipulated to differentiate into particular specialised cells

These qualities mean that scientists have both a potentially endless supply of raw research material and the means to develop a staggering number of therapeutic applications. These range from gene therapy to developments in so-called regenerative medicine where diseased or damaged cells can be replaced in conditions such as diabetes, Parkinson's disease, chronic heart failure and injuries to the spinal cord.¹⁴

But, as should by now be clear, not all stem cells can differentiate into all kinds of cells. Presently, most promise of this lies with embryonic stem cells that are extracted from the blastocyst when they have pluripotent qualities. It is important to re-emphasise that no embryo can be derived from such cells. Equally importantly, however, is the fact that the blastocyst is

¹¹ S. Pickering et al. 'Preimplantation Genetic Diagnosis as a Novel Source of Embryos for Stem Cell Research', (2003) 7(3) Reproductive BioMedicine Online, available at <www.rbmonline.com/Article/1074>.

¹² D. Graham-Rowe, 'Regenerating the Retina' 177 (2380) New Scientist, 1 February 2003, 14.

¹³ Y. Jiang et al. 'Pluripotency of Mesenchymal Stem Cells Derived from Adult Marrow', 418 Nature, 4 July 2002, 41-49, and R. Nowak, 'Do Nose Cells Know How to Bridge the Spinal Gap?', 175(2351), New Scientist, 13 July 2002, 18.

¹⁴ N. 7 above, paras. 1.3-1.6.

destroyed in this process. If one views this organism as embryonic life at this stage we have, then, the makings of a classic ethical controversy.

The ethics of stem cell research

Research using the human embryo is ethically problematic for a number of reasons, all of which centre around the moral status of this organism. While some consider it to be a human being from conception and deserving of full respect, most people do not see it this way, and most legal systems accord the embryo a special status which falls short of conferring the protection of full legal human rights and privileges. But, whatever we view we might take of its status, most agree that the human embryo is somehow unique, even if we cannot agree on how it should then be treated. Biologically speaking, it is undoubtedly a human organism, and as such, we tend to accord it some degree of respect. Thus, any process which not only instrumentalises the embryo but actually results in its complete destruction, necessarily raises moral qualms and dilemmas. Legal responses around the world towards embryo research, for example, vary considerably and range from no law at all (Italy) to outright ban (Germany) and through the highly controversial 'middle' ground of allowing the creation of embryos for strictly controlled research purposes (UK).¹⁵

From the strict ethical viewpoint, if the same ends could be achieved by less problematic means - for example by using adult stem cells - then those means should be preferred. But the case for adult stem cell research is currently far from proven. Moreover, any other means which do not require the creation (and destruction) of an embryo should be pursued. One such example is parthenogenesis whereby an egg can be electrochemically stimulated into forming a blastocyst without the need to be fertilised by human sperm. Such an entity can never develop into a human embryo with the potential for independent existence. Unfortunately, this technique remains at an early stage of development.

In the absence, then, of hard evidence and consensus about the value of alternatives, and faced with the considerable promise that embryonic stem cell research holds, it has been difficult for governments to resist the relentless push of science in its favour. The European Commission,

¹⁵ B. Gratton, 'Survey on the National Regulations in the European Union Regarding Research on Human Embryos' (July 2002) prepared for the European Group on Ethics in Science and New Technologies to the European Commission), available at:
< http://europa.eu.int/comm/european_group_ethics/docs/nat_reg.pdf>.

for example, recently relaxed its rules on funding research using human embryos and on embryonic stem cells- and this despite the European Parliament's earlier attempts to exclude such work via amendments to the human tissue Directive.¹⁶

Thus, the regulation of embryo and embryonic stem cell research is a hotly contested matter. No clear consensus has emerged at the European or international level, leaving regulatory bodies in individual states to police the parameters of the research. One might ask, as a result, what role intellectual property rights have, or should have, in the current debate and longer term strategic planning of stem cell research.

The ethics of patents over inventions involving embryonic stem cell technology

Despite protests from a variety of quarters, it is axiomatic that ethical considerations have a role to play in the granting of a patent. This is now recognised in the European Directive on the legal protection of biotechnological inventions,¹⁷ and similar provisions have been adopted by the Administrative Council of the European Patent Office.¹⁸ What is far less clear, however, is the nature of the ethical issues at stake and how far patent law can accommodate these issues. In particular, there is a consistent failure to distinguish concerns about scientific or technical advances per se from those about the grant of a patent over the products and processes arising from such advances. And, despite the fact that disquiet and discussions of an ethical nature held up the adoption of the biotechnology Directive for so long, it is far from clear that we are any further forward in developing uniform, logical, principled, and defensible ethical guidelines within European patent law. This is borne out by recent developments regarding the patenting of stem cells of human origin.

The prospect of patenting the products of stem cell research was the subject of an Opinion by the European Group on Ethics in Science and New Technologies (EGE) in 2002. It reported that over 2000 patent applications had been lodged around the world, a quarter of which related

¹⁶ European Parliament legislative resolution on the proposal for a European Parliament and Council directive on setting standards of quality and safety for the donation, procurement, testing, processing, storage, and distribution of human tissues and cells (COM(2002) 319 - C5-0302/2002 - 2002/0128(COD)), P5_TA-PROV(2003)0182, available at:

<http://www3.europarl.eu.int/omk/omnsapir.so/pv2?PRG=CALDOC&FILE=030410&LANGUAGE=EN&TPV=PROV&LASTCHAP=13&SDOCTA=3&TXTLST=1&Type_Doc=FIRST&POS=1>.

¹⁷ Directive 98/44/EC of 6 July 1998 on the legal protection of biotechnological inventions, most particularly Articles 5 and 6 and associated recitals.

¹⁸ Guidelines for Examination in the European Patent Office (1999).

to embryonic stem cells. Over a third of all stem cell applications had been granted, as had a quarter of those related to embryonic stem cells.¹⁹

The Commission's report on the biotechnology Directive expresses general contentment with the provisions of Articles 5 and 6 where we find the key morality provisions now operative throughout the European Union.²⁰ At the risk of unnecessary repetition, it is nonetheless useful to repeat the precise terms:

Article 5

1. The human body, at the various stages of its formation and development, and the simple discovery of one of its elements, including the sequence or partial sequence of a gene, cannot constitute patentable inventions.
2. An element isolated from the human body or otherwise produced by means of a technical process, including the sequence or partial sequence of a gene, may constitute a patentable invention, even if the structure of that element is identical to that of a natural element.
3. The industrial application of a sequence or a partial sequence of a gene must be disclosed in the patent application.

Article 6

1. Inventions shall be considered unpatentable where their commercial exploitation would be contrary to ordre public or morality; however, exploitation shall not be deemed to be so contrary merely because it is prohibited by law or regulation.
2. On the basis of paragraph 1, the following, in particular, shall be considered unpatentable:
 - (a) processes for cloning human beings;
 - (b) processes for modifying the germ line genetic identity of human beings;
 - (c) uses of human embryos for industrial or commercial purposes;
 - (d) processes for modifying the genetic identity of animals which are likely to cause them suffering without any substantial medical benefit to man or animal, and also animals resulting from such processes.

Embryonic stem cell patents raise the potential for conflict with Article 6 where it prohibits 'uses of human embryos for industrial or commercial purposes'. The Directive does not, however, define 'embryo'. This may seem a self-explanatory term to many, but recent legal disputes in the UK demonstrate that this is far from true. In *R (on the application of Quintavalle) v Secretary of State for*

¹⁹ N. 8 above, para 1.16.

²⁰ Particularly in light of the European Court of Justice ruling in *C-377/98 Kingdom of the Netherlands v Council of the European Union and the European Parliament* [2002] All ER (EC) 97.

Health²¹ disagreement about the definition of 'embryo' in the Human Fertilisation and Embryology Act 1990 required a House of Lords ruling to resolve the matter. The 1990 Act provided that 'embryo' means 'live human embryo where fertilisation is complete' and the challenge from Quintavalle was that an organism produced by Cell Nuclear Replacement (cloning) was not an embryo because it was produced without the need for fertilisation; this being the union of a female egg and a male sperm. CNR is performed by removing the nucleus of an egg, replacing it with genetic material from a donor and stimulating cell division artificially. In the end, however, the House of Lords took a purposive interpretation of the Act and held that Parliament could not have intended to exclude organisms created in this way from the protection of the law.²² Nonetheless, the case demonstrates the imprecise nature of the central term, and one is left to wonder how it might be interpreted for the purposes of patent law. In other European jurisdictions, the legal definition of embryo is similarly tied to the process of fertilisation, yet embryos created by CNR, or indeed parthenogenesis, are not technically produced in this fashion. A narrow interpretation would suffice to exclude such organisms from the scope of Article 6. Indeed, such a restricted approach would be in keeping with the spirit of the Directive and other rulings already delivered on morality provisions in patent law.²³ How, then, will Article 6 be construed in relation to embryonic stem cell patent applications? A number of recent developments point the possible way forward.

Current guidance on patenting embryonic stem cells

The Edinburgh patent and the EPO

The so-called 'Edinburgh' patent (EP 0695351) was originally granted by the European Patent Office to include claims in respect of 'animal transgenic stem cells' but this raised concerns when it was suggested, *inter alia*, that it might extend to human cloning. The patent was amended in Opposition proceedings in July 2002 to exclude mention of human or animal embryonic stem cells, although it still covers other modified human and animal stem cells. The European Parliament has pointed to the decision and urged member states to recognise that this

²¹ [2003] UKHL 13, [2003] 2 All ER 113.

²² JK Mason 'Clones and Cell Nuclear Replacements: A Quintavalle Saga', (2003) 7 *Edinburgh Law Review* 379.

²³ See, for example, HARVARD/ONCO-mouse [1991] EPOR 525, PLANT GENETIC SYSTEMS/Glutamine Synthetase Inhibitors [1995] EPOR 357 and HOWARD FLOREY/Relaxin [1995] EPOR 541. The EPO confirmed in *Relaxin* that the morality provision should only be applied to prevent the grant of patents that would universally be regarded as outrageous.

demonstrates that the EPO can, and does, show due concern for the ethical dimensions of patenting.²⁴

The Opposition Division was called upon to interpret Article 53(a) of the European Patent Convention (EPC) and Rule 23d(c) EPC, following which European patents shall not be granted for uses of human embryos for industrial or commercial purposes. This is clearly a reflection of the terms of Article 6 of the biotechnology Directive, as was the intention of the EPO Administrative Council when it amended its Guidelines in 1999.²⁵ Interestingly, the Opposition Division noted that the provision could be interpreted in one of two ways: narrowly, to mean that only commercial uses of human embryos as such are excluded from patentability, or broadly, to mean that human embryonic stem cells - which as we have noted can only be obtained by destroying an embryo - are also not patentable. In opting for the latter interpretation, the ruling sits awkwardly with other morality rulings from the Opposition Division, as explained above. Indeed, the approach is particularly broad given that (a) pluripotent embryonic stem cells are not embryos - however we might define the latter term - nor can they ever be, and (b) a right to control the commercial use of these stem cells inventions is not a right to use embryos as such. It is true, of course, that embryos must be used to create these inventions, but if this is the interpretation to be adopted it represents an objection to general instrumental use. This is a much broader question than the issue of granting a monopoly right and it is not clear that it is something that is within the appropriate remit of any arm of the EPO.

Nonetheless, the ruling as it stands sends a clear and cautious message about patenting practice in respect of embryonic stem cell inventions, doubtless reflecting broader social concerns, but the underlying principles behind the decision remain elusive. While the ruling is technically weak in terms of precedent, and there is as yet no decision from a Board of Appeal to clarify matters, the Edinburgh patent opposition has already had a restraining effect on patent examiners. There is evidence, for example, that a number of examining divisions has taken a similar line to that in the Edinburgh case and issued Official Actions accordingly. And in at least one other case the patent application has been refused, although this was subsequently granted in amended form.²⁶

²⁴ European Parliament resolution on the Commission communication on life sciences and biotechnology – A strategy for Europe, 21 November 2002, 68/PE 325.104, para. 3.9.

²⁵ N. 18 above.

²⁶ I am grateful to Dr Siobhan Yates of the European Patent Office for a personal communication confirming the position. Any error in recounting matters is mine alone.

The European Group on Ethics and the UK Patent Office

Before commenting further on the robustness of this approach, it is useful to note other guidance that has been issued at both the European and the national level as this diagram illustrates.

Time ↓	EUROPEAN GROUP ON ETHICS	UK PATENT OFFICE
	<ul style="list-style-type: none"> ▪ Processes for creation of embryo by cloning for stem cells [unpatentable] 	
	CREATION OF "EMBRYO" (DAY 0)	
	<ul style="list-style-type: none"> ▪ Isolated stem cells [unpatentable] ▪ Unmodified stem cell lines [unpatentable] ▪ Inventions allowing the transformation of unmodified stem cells into modified stem cell lines [patentable] ▪ All processes involving stem cells of whatever source [patentable] 	<ul style="list-style-type: none"> ▪ Processes for obtaining stem cells from the human embryo [unpatentable] ▪ Human totipotent cells (Days 3-4 – each cell can develop into unique embryo) [unpatentable] ▪ Human embryonic pluripotent stem cells [patentable] ▪ Related cell lines and processes [patentable]

One can see from this table that what might be termed early stage interventions are those to be excluded from patent protection. But for what reasons, and how does this square with the underlying rationale of Article 6, or indeed, with other terms of European patent law?

•Processes for cloning an embryo – this is expressly prohibited by Article 6, but once again the application of the section depends on how we define ‘embryo’. As explained, an organism created by CNR is not an embryo produced by fertilisation, as most legal systems define the term. Moreover, the definition of ‘cloning’ provided by Recital 41 of the Directive, which states that ‘...a process for cloning human beings may be defined as any process, including techniques

of embryo splitting, designed to create a human being with the same nuclear genetic information as another living or deceased human being...’, takes us no further forward because it simply begs the secondary question, what is a human being? The in vitro organism has no potential for independent life - is it therefore an embryo or a human being?

- Processes for obtaining stem cells from an embryo – this is thought to be caught by Article 6 because it is direct use of an embryo in a sense similar to that understood in the Edinburgh patent. Accordingly, it raises the issue of whether this is an accurate or appropriate understanding of the term ‘use’ in the context of patent law.

- Totipotent human cells – the UK Patent Office states that ‘[h]uman totipotent cells have the potential to develop into an entire human body. In view of this potential, such cells are not patentable because the human body at the various stages of its formation and development is excluded from patentability by Paragraph 3(a) of Schedule A2 to the Patents Act 1977.’²⁷ This, then, is seen to be a contravention of the equivalent provisions to Article 5 of the Biotechnology Directive. In real terms, however, the exclusion is unlikely to cause problems for prospective patentees since stem cell lines are developed from cells at the pluripotent, and not the totipotent, stage.²⁸ Furthermore, from the scientific perspective, it will be impossible to determine a difference between totipotent and pluripotent cells without actually demonstrating the former by growing them. This is, therefore, a legal distinction without a scientific difference, revealing the frailty of the guidelines as a result.²⁹

- Isolated stem cells – the European Group on Ethics (EGE) opines that ‘...such isolated cells are so close to the human body, to the foetus or to the embryo they have been isolated from, that their patenting may be considered as a form of commercialisation of the human body’.³⁰ The source of this concern about commercialisation is the Council of Europe’s Convention on Human Rights and Biomedicine (1997).³¹ This, however, is clearly not a part of patent law. Moreover, it is puzzling why no consideration was given to Article 5(2) of the Biotechnology Directive which explicitly provides that, ‘[a]n element isolated from the human body or

²⁷ UK Patent Office Practice Notice ‘Inventions involving human embryonic stem cells’ (April 2003), available at: <<http://www.patent.gov.uk/patent/notices/practice/stemcells.htm>>

²⁸ Processes to produce totipotent cells of humans and animals are also excluded from patentability by Recital 38 of the Directive, n. 2 above.

²⁹ I am grateful for this point to the discussants at the Medical Research Council conference on ‘Stem Cells: Shaping the Future’, London, 15-16 September 2003, at which an earlier version of this paper was delivered.

³⁰ N. 8 above, para. 2.3.

³¹ Article 21 states: ‘the human body and its parts shall not, as such, given rise to financial gain’.

otherwise produced by means of a technical process...may constitute a patentable invention, even if the structure of that element is identical to that of a natural element'. Indeed, this is the standard argument that is put to justify the patenting of genetic material taken from the human body. The stronger argument, however, which is also put by the EGE, is that '[i]solated stem cells which have not been modified do not, as product [sic], fulfil the legal requirements, especially with regards to industrial applications [sic], to be seen as patentable'. This is undoubtedly true and an entirely fit and proper consideration for a patent office; a matter to which we shall return presently.

- Unmodified stem cell lines – the EGE considers that these lines do not have a specific use but rather a potentially wide range of undescribed uses. This is important on two grounds. First, the criterion of industrial applicability requires that a European patent application 'should...indicate the way in which the invention is capable of exploitation in industry'.³² Second, it can lead to overly-broad patents. For these reasons, the EGE recommends that unmodified stem cell lines should not be patentable. As an aside, we should note that neither justification is based on a concern about embryos per se.

What are the aims of morality provisions in patent law and can these be met?

We can extract from the above discussion a number of different concerns surrounding stem cell technologies and the prospect of patenting the outcomes of stem cell research. First, we should note that the concerns are not necessarily about the embryo, as the last example demonstrates. The problem of granting overly-broad patents is well documented. It is, in turn, a moral issue - albeit of a different nature to those already discussed. This is so to the extent that excessively broad patents are not only unjust but they may have a wider adverse impact of human lives if, for example, technologies, drugs or therapies are not developed as a result, or if those that are developed are too expensive for many to afford. The so-called WARF application is currently pending before the EPO in respect of the isolation, culture and proliferation of human embryonic stem cells and derived stem cell lines.³³ A patent has already been granted in the US, but there are concerns that the claims are potentially so broad as to hinder drastically or put an end to much stem cell research in Europe if a patent is also granted here on similar terms.

³² Guidelines for Examination in the European Patent Office, Part C, Chapter IV, 4.6.

³³ N.8 above, para. 1.17.

In similar fashion, the exclusion of isolated stem cells does not reveal a concern about embryos, but rather a concern that the reward of the patent is not deserved, that is, that the putative invention does not properly satisfy the criteria for patentability. The decision to grant a patent, and if so on what particular terms, is a moral issue and the recognition of this by groups such as the EGE should, once and for all, put an end to arguments that patenting has little or nothing to do with morality.

This having been said, clearly not all moral concerns about stem cell technology can, or should, be dealt with by the patent system. Indeed, it is vitally important that we be clear about the appropriate type of influence that patent examiners can, or should, attempt to exercise. Many of the above exclusions indicate that we have not yet reached this point. For example, the Edinburgh patent reveals a more general underlying unease about stem cell technology; but it is not for patent law to address that concern if the objection is to the science rather than to the grant of a monopoly right. Not only is it a matter more appropriately tackled by regulatory authorities using their entire gamut of legal tools, but the deep irony is that patent law cannot address such a concern. The sole power that a patent examiner or court has is to deny or revoke a patent. The consequence of this, however, is not that the science will be stopped but rather that it may potentially be encouraged, in that now anyone is free to exploit the technology. Of course, one obvious retort to this is that the absence of a patent incentive will discourage the research - and this might be true - but it is an extremely inefficient and potentially ineffective means by which to tackle one's moral concerns. It leaves us to wonder what is the proper application of Article 6 in the context of the use of stem cells of human origin.

Can Article 6 meet its own aims?

Both the European Commission³⁴ and the European Court of Justice³⁵ have quite clearly stated the underlying rationale of Article 6 with respect to human embryos. This is (a) to respect human dignity, and (b) to guard against instrumentalisation of the human body. Leaving aside questions of 'humanness', on this view the exclusion of early stage interventions seems, at first glance, to make some moral sense because the closer we are to treating a naturally occurring human organism as a commodity the more offensive it becomes. However, this distinction does not stand up to critical reflection because the production of embryonic stem cells is a continuum. Thus, the prohibition on patenting early stage interventions coupled with the possibility of the

³⁴ N. 3 above, para. 5.2.

³⁵ N. 20 above, paras 76-77.

grant of patents at a later stage positively encourages the creation of stem cells, which necessarily involves the use (and destruction) of embryos. Indeed, the availability of patents means that there is good (economic) reason to pursue embryonic stem cell research rather than fetal³⁶ or adult stem cell research. Subtle and narrow distinctions about the scope of the exclusions neither necessarily respect the dignity of embryos nor prevent their use towards ends other than their own.

Pragmatism over ethics?

An answer to this might be that Article 6 should be concerned solely with the question of whether the commercial exploitation of a single, particular invention is immoral or contrary to ordre public. The inclusion of specific examples of non-patentable inventions has blurred the distinction between valid objections to patent monopolies and objections to offensive inventions. Furthermore, questions about the wider impact of granting patents should not concern the patent office in the instant case. This might be seen as adopting a position of pragmatism over ethics, but it is not an approach that is entirely alien to the EPO.³⁷

Ethics over pragmatism?

An alternative approach is to concede that all systems are interconnected and that the wider realities of granting patents should not be ignored. This would require not only a much broader view of morality than we have seen but, at the very least, a consistency of approach whereby we would begin to question not only the validity of applications over isolated stem cells or unmodified stem cell lines or totipotent cells, but over virtually all inventions deriving from the exploitation of embryos. If respect for human dignity is truly the ethical underpinning of Article 6, then we must recognise that human dignity cannot be compartmentalised.

Current practice appears ambivalent about which of these two approaches to follow - we can find elements of each depending on where we look - and the truth may be that neither path is acceptable as the two views tend to polarise the debate. But might a way be found of steering practice on a middle course?

³⁶ This, of course, depends on one's attitude towards abortion, although there is no suggestion that fetuses should be aborted in order to facilitate stem cell research. Rather, fetal material is collected only once the abortion decision has been made and the procedure has been carried out free from any undue influence. One must bear in mind too that fetal material can be made available from spontaneous miscarriages.

³⁷ See n. 23 above.

Ethical pragmatism

As has been stated, difficulties have arisen because of a consistent failure to distinguish between objections to an invention itself and objections about its commercial exploitation. We have arrived at this situation because we have never been clear about what the morality provisions in patent law actually mean nor about what purposes they should serve. This has been compounded by the adoption of the ill-conceived terms of Article 6 which in reality represent little more than a snapshot of the hottest ethical controversies at the time when the Directive was adopted. It has taken the advent of embryonic stem cell technology to expose the weakness of the system and the hopelessly confused state in which we now find ourselves. Let us consider three alternatives.

A. If we accept the permissibility of embryo research, are there any objections of a different order about granting patents over derived products or related processes? We may, of course, object to the scope of a particular patent, but that is not the same as objecting to the patent itself. By corollary, we might consider that the invention is so valuable that it should be freely available to all, but this undermines the countervailing rationale of patent law which is to strike a balance of interests. What few examples we have in Europe - such as the exclusion of methods for treatment of the human or animal body and diagnostic methods practised on the human or animal body³⁸ - require specific legal provision and narrow interpretation and are out of step with practice elsewhere.³⁹ Nor can it be argued that patenting is an unacceptable form of exploitation while 'pure' embryo research is not because the commercial realities of modern science are such that the funding to carry out the research will simply not be available without the promise of downstream patents. To embark on large scale expensive research today is, therefore, to commit to a programme of systematic commercialisation and exploitation. This approach achieves consistency because it accepts instrumentalisation of embryos and the consequences of this, one of which is patenting. To patent products derived from legally-sanctioned research differs only in the degree of instrumentalisation involved. It is debatable whether the degree of difference is so great as to justify the denial of patent protection.

B. If we do not accept the permissibility of embryo research then, a fortiori, patenting is also unacceptable.⁴⁰ Indeed, legal prohibition in a realm such as embryo research is likely to be a

³⁸ EPC, Article 52(4).

³⁹ See, for example, Unilever's (Davis') Application [1983] RPC 219, Tectronics/Pacemaker [1996] OJ EPO 274, and Bristol-Myers Squibb v Baker Norton [2001] RPC 1.

⁴⁰ As acknowledged by the European Group on Ethics in its Opinion, n.8 above, para 1.21.

much more balanced and accurate measure of an invention's unacceptability to citizens within a particular jurisdiction than is the application of the exclusions of Article 6 by a patent office. It is at least consistent to reject embryo research and the patenting of products derived from uses of embryos as examples of practices that are unacceptable by virtue of being contrary to human dignity.

C. But what if the law is silent on embryo research? In such a case we might once again hear the call that the prospect of patenting leads to offensive practices, in that it might encourage research which is offensive per se. To respond to this by denying patent protection, however, allows patent law to drive wider regulatory considerations and tempts pre-emptive moral judgments that may then take on the mantle of precedent. The Edinburgh patent is a possible example of this already happening. Moreover, the ever-shifting moral climate is not one in which dubious moral precedents should be established. The recent change of heart by the European Commission over funding stem cell research is but one example, and the recent lifting of a legal ban on embryo and stem cell research by Spain is another.⁴¹ Finally, if the claim is that the availability of a patent might encourage a particular practice, we must recognise that our fundamental objection lies with the practice rather than with patenting and our efforts should be directed accordingly. In short, the absence of legal prohibition on embryo research should result in a more liberal, not a more restrictive attitude towards patenting practice.

As a final point, the fact that Article 6 provides that '[i]nventions shall be considered unpatentable where their commercial exploitation would be contrary to ordre public or morality; however, exploitation shall not be deemed to be so contrary merely because it is prohibited by law or regulation', [emphasis added], means only that an invention cannot be deemed unpatentable merely because it is outlawed. It does not follow that illegality cannot be taken as a measure of immorality, nor, indeed, that it cannot be an important factor in that assessment for the purposes of patent law.

Conclusion

Inventions involving embryonic stem cells are but the first in a long line of controversial patent applications that are set to beleaguer the patent offices of Europe. Article 6 of the biotechnology Directive fails to provide us with sufficient clarity or consistency of approach within European patent law; indeed, our current ethical approach is entirely unprincipled. As a starting point, we

⁴¹ X. Bosch, 'Spain to Allow Human Embryo Research', 31 July 2003, *The Scientist*, available at: < <http://www.biomedcentral.com/news/20030731/03>>.

should seek to separate (a) ethical objections to scientific developments themselves - which are best dealt with entirely outside the patent system from (b) ethical concerns about the scope of patent monopoly and the consequences of granting such a monopoly - which are entirely appropriate questions for the patent system. Thereafter, we should revise the terms of the biotechnology Directive to exclude any specific examples from the morality provisions in order to emphasise the fact that morality in this context is about commercial exploitation only. More broadly, the moral conscience of individual countries towards embryonic stem cell patents is probably best measured by their approach to embryo research. The problems of legislating for a European morality are well-rehearsed elsewhere - and most notably in the context of human rights discourse⁴² - but we will have to face the patenting issue sooner rather than later as the prospect of the Community patent looms large. Assuming this is introduced, the approach towards interpretation of morality issues in patent law should be cognisant of the diversity of approach around the Community; hopefully by this time a more coherent and justified ethical stance towards controversial patents will have developed. The EGE, for its part, has called for independent ethical review in particularly controversial patent applications.⁴³ Whoever might take on this task must get the rationale right and ensure that the relevant ethical principles that relate to patent law are properly recognised.

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⁴² For a discussion of the possible relationship of human rights to patent law see, R. Ford, 'The Morality of Biotech Patents: Differing Legal Obligations in Europe' [1997] EIPR 315-318.

⁴³ N.8 above, para. 2.10.