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Umbilical Cord Blood: from Social Gift to Venture Capital

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Umbilical cord blood has proved an effective substitute for bone marrow in the treatment of blood disorders, and most nations in the developed world have public programs for the harvesting and storage of cord blood for allogenic transplantation. Private cord blood banks have sprung up alongside public banks, offering parents the opportunity to bank their child’s cord blood for later personal use. Private cord blood banking has been largely condemned by bioethical and medical professional bodies, on the grounds that the likelihood of any particular individual needing a cord blood transplant is very low, and that public, redistributive banking is a more efficient use of resources. This paper investigates the appeal of private cord blood banking in the face of such condemnation, and the social norms implied in public and private cord blood banking. It locates cord blood banking in the field of regenerative medicine, and considers the two different models of biological regeneration implied in public, gift-based banking and private, autologous banking. In the first case, regeneration of sick bodies is an effect of social redistribution and intercorporeal generosity between citizens. In the second, regeneration is promised by the retention of cord blood as a form of personal property. The private cord blood account appeals to certain neoliberal norms of entrepreneurial embodiment, acting as a kind of asset or venture capital invested in the future of biotechnological innovation.

Keywords: Umbilical Cord Blood, Tissue Banking, Social Values, Neoliberalism, Embodiment

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Introduction

Regenerative medicine is a relatively new medical discipline, which seeks to enhance the body’s self-regenerating capacities. Along with other mammals, the human body has a limited ability for self-repair – wounds heal, blood regenerates, liver lobes re-grow. However many diseases and injuries involve the loss of specialized tissues which do not regenerate; spinal cord injury and dopaminergic neurons in Parkinson’s disease, for example. Regenerative medicine seeks to identify the mechanisms of self-production involved in auto-regeneration and to enhance and develop them into therapies for those tissues that do not regenerate spontaneously. Regenerative techniques focus on tissue engineering (Fauza 2003), the development of supplementary growth factors, and the enhancement of the body’s own stem cell capacities to repair cells, tissues, and organs (Fodor 2003). Cell-based strategies include cell therapies derived from autologous primary cell isolates, from established cell lines and from bone marrow and cord blood stem cells. Regenerative medicine also involves allogenic tissue sources like embryonic stem cells, and cells tissues and organs from genetically modified animals (Costa, Zhao, Burton et al. 2002). If successful, such techniques could rebuild neurological tissue in stroke or Alzheimer’s disease, grown skin for burns victims, bone for hip-replacements, and provide new organs for those with organ failure.

Autologous bone marrow and peripheral blood treatments are routinely used in some kinds of cancer therapy, but most regenerative medical techniques are still highly experimental. Many new techniques, developed primarily by commercial biotechnology firms, are in clinical trial for other kinds of conditions. For example, Aastrom Biosciences has conducted a series of clinical trials using bone marrow-derived adult stem and progenitor cells to treat breast cancer, long bone fractures, and lower limb ischemia in
diabetic patients\(^2\). A number of small clinical trials around the world are testing the injection of bone-marrow stem cells into regions of the heart to promote the development of vascularization after heart attack\(^3\). Ortec International, a tissue-engineering company, has completed a phase three clinical trial of a collagen cell matrix that secretes growth factors and cytokines to promote tissue repair for ulcers\(^4\). While it is estimated that over seventy companies are developing clinical applications for various kinds of tissue engineering alone (Fauza 2003), the pathway to approval is difficult and most regenerative techniques remain experimental. At 2003, only two autologous cell therapies had been approved by the FDA: the repair of cartilage using autologous chondrocytes and the treatment of burns with autologous cultured keratinocytes (Fodor 2003).

It remains to be seen if the regenerative medicine model will yield significant therapeutic results. Experimental treatments for neurological disorders like Parkinson’s disease and Alzheimer’s disease using stem cell-based approaches have yielded poor and occasionally harmful results\(^5\), and many commentators remain dubious about the large claims made by advocates. Nevertheless, the regenerative medicine research effort represents a significant innovation in the *biomedical imagination*\(^6\) regarding the best ways to regenerate bodies. Since blood donation became a viable therapy in the early twentieth century, the *redistribution* of tissue, from bodies with a surplus to those with a deficit, has been the primary means of regeneration. Medicine has developed complex systems for the sourcing and redistribution of human tissues from one person to another. Blood banks, first set up in the early days of World War Two (Starr 1998), facilitate various forms of collection, storage, fractioning and transfusion. Solid organ transplantation has been practised since the late 1950s, and *in vitro* fertilisation techniques developed for humans in the 1970s enable the transfer of ova, sperm and embryos. Current research on embryonic stem cells promise a completely new regime of allogenic tissue transfer, which may be able to
substitute for whole organ transplant, among other treatments (Carpenter, Rosler & Rao 2003).

Each of these allogenic tissue networks regenerate bodies through redistribution from donor to recipient, often mediated by various kinds of tissue banks. With the exception of solid organs, which are generally donated posthumously, healthy bodies can regenerate each of these tissue types. Donors give what they can afford, and may give repeatedly, because, over time, their bodies will regenerate the tissues lost. Organizations like blood banks often rely on the regular donor to keep their supplies in credit. Tissue banks in turn provide this material for transplantation in cases of trauma, blood disorders, infertility, cases where the person concerned cannot generate enough healthy tissue of their own.

Regeneration through allogenic tissue networks is also associated with particular social values and relationships. The redistribution of human tissues through donation has historically been associated with qualities of ethical citizenship, altruism and communitarian values. The origin of blood banking in the allied war effort has constituted the voluntary donation of blood as an act of social solidarity and national generosity. As Paul Rabinow comments, ‘after the war, transfusion carried with it the mark of solidarity, of a voluntary and benevolent gesture, of a collective effort of the entire nation’ (Rabinow 1999: 84). While some tissues, notably plasma and reproductive material, can be sold in the USA, the gratuitous donation of human tissues is regarded as good social policy and sound bioethical principle in the EU, Australia, Canada and most other developed countries.

This consensus follows on from Richard Titmuss’ eloquent defense of voluntary tissue donation in The Gift Relationship: from Human Blood to Social Policy, first published in 1970 (Titmuss 1997). He explicitly links the gift of blood with qualities of civil inclusion and social justice, and with the redistributive ethics of the welfare state. Following Mauss’ famous Essay on the Gift (Mauss 1990), Titmuss argued that gift
relations are crucial to the formation of mutuality among citizens. Giving gifts creates the obligation to reciprocate, and so the circulation of gifts creates a web of indebtedness and exerts a continued pressure for reciprocity. Giving and receiving blood (and by extension other kinds of tissues) creates the conditions for what Benedict Anderson was later to call imagined community (Anderson 1991); an anonymous identification among fellow citizens, a sense of impersonal mutuality and inclusion, of trust among strangers, and gratitude not toward particular persons but to the social body as a whole. The blood bank, as the manager of the blood gift economy, becomes a site for the constitution of both collective health and the best values of citizenship. Voluntary donation maintained the body politic of the welfare state by creating a particular kind of civil intercorporeality, one where the explicit relations of indebtedness between bodies would provoke a continued round of donation, a continuing replenishment of both the population’s vitality and its generosity. To put it another way, the gift of tissues from one person to another was a means to regenerate both the bodies of citizens, and the values associated with the post-war welfare state.

While the forces of neo-liberalism and globalisation have eroded somewhat the collective, national values and redistributive institutions celebrated by Titmuss, the desirability of the gift relationship is still a centerpiece of most national policies around the harvesting and distribution of human tissues. For example, the UK Medical Research Council Operational and Ethical Guidelines on the Use of Human Tissues for Research states,

We recommend that tissue samples donated for research be treated as gifts or donations, although gifts with conditions attached. This is preferable from a moral and ethical point of view as it promotes the ‘gift relationship’ between research participants and scientists, and underlies the altruistic
motivation for participation in research (Medical Research Council 2001: 8).

If donation to allogenic networks implies good citizenship and contribution to the collective good, what values might we associate with autologous regenerative medicine, which seeks a surplus not from the generosity of the body politic but from within the person’s own body? To some extent, regenerative medicine is intended as an answer to some of the technical and social difficulties that have grown up around allogenic tissue donation. Autologous cell therapies would dispense with the need for immunosuppressive drugs currently required to prevent rejection when allogenic tissue, other than blood, is transplanted. Autologous material, harvested from a person, expanded \textit{ex vivo}, and reintroduced in a potentiated form, could also help overcome the problem of persistent blood and organ shortages. Blood donation in the USA, the UK and elsewhere has been in decline since 1984 (Robertson & McQueen 1994, Wallace \textit{et al.} 1995, Wallace \textit{et al.} 1998, Sullivan \textit{et al.} 2002). This decline is at least partly due to the HIV and Hepatitis contamination scandals of the 1980s, and a consequent loss of trust in blood banks among potential donors (Finucane, Slovic & Mertz 2000). While rates of organ donation have increased slightly in many developed countries over the last ten years, the demand for organs far outstrips supply (World Health Organization 2003). In other words, the gift relationship in these areas has not proved sufficiently persuasive to meet demand with adequate supply, so that other means of marshaling a tissue surplus have been sought. Many health economists advocate some form of regulated market for solid organs, involving compensation for donor’s families, for example, as a way to boost the supply side of therapeutic tissues (Joralemon 2001). Such market proposals are also highly associated with particular social values however. While market advocates generally base their arguments on the pragmatic difficulties of supplying sufficient human organs (e.g.
Barnett, Beard & Kaserman 1993), opponents associate human tissue markets with exploitation and dehumanization, the reduction of human status to the status of a thing (Andrews & Nelkin 2001, Scheper-Hughes 2000, Kimbrell 1997). Scheper-Hughes, for example, likens the commodification of organs to a new form of late modern cannibalism in which the wealthy incorporate the bodies of the poor (Scheper-Hughes 2002).

Regenerative medicine could be seen as a compromise position between the social generosity of the gift and the exploitative utilitarianism of tissue markets. It involves neither a generous donation nor an exploitative acquisition, but rather uses the individual’s body as its own resource, potentiated by prosthetic or ex-vivo interventions. However, I want to suggest in this paper that the technical economy of regenerative medicine is not as socially neutral as this implies. Here I want to consider the particulars of a contemporary regenerative medicine economy that, while still somewhat experimental, is nevertheless in widespread clinical application – umbilical cord blood. Cord blood is rich in hematopoietic (blood generating) stem cells, and has proved a useful alternative to bone marrow transplant in the treatment of blood disorders. Like bone marrow, it can literally regenerate a patient’s blood and immune system. It is an informative test case regarding the social economy of regenerative medicine because it exists in two distinct forms – an allogenic tissue network, based on gifting to public cord blood banks, and a private, autologous cord blood account, where parent bank their child’s cord blood for future use. In other words, it circulates according to the logics of both the gift relationship, as a redistributed substance where one person donates their regenerative capacities to another, and the regenerative medicine paradigm, in which the body serves as the source of its own self-renewal.

These alternative forms have not been regarded as equal or socially neutral by commentators. Clinicians, public health practitioners and bioethicists have almost universally condemned private cord blood banking, on the grounds that it diverts clinically valuable cord blood from public banks into private accounts, where the likelihood of use is
very slim. The privatisation of cord blood has also been roundly condemned for detracting from the gift relationship. Commentators argue that private cord blood firms play on parental anxieties in such a way that they encourage selfish and misguided hording, rather than social altruism. I will detail some of these arguments in greater detail below.

Here I want to pursue a different line of inquiry. While I am in broad agreement with the criticisms outlined above, I think they neglect an important aspect of the appeal that private cord blood banking holds for advocates and clients. This appeal derives from the location of private cord blood banking within a domain of neo-liberal values, organised around the virtues of private property, entrepreneurial investment and technocratic progress. I will argue that private cord blood banking has attracted a client base not only because it exaggerates the risks of individual children needed a cord blood transplant, but also because it offers a form of popular participation in the open-ended promise of commercial biotechnology, a means to speculate on the future of biotechnical developments. In what follows, I will first describe the biology and institutional management of umbilical cord blood. I will then consider the speculative logics that underpin private cord blood banking and their relationship to neo-liberal forms of health entrepreneurship more generally. To do this I will draw on the fairly small amount of available empirical research and a larger body of journalistic inquiry into the reasons that clients give for using private banking, along with an analysis of the ways private banks advertise their services. More broadly, I will situate this material in an analysis of the technical logics and claims of regenerative medicine and stem cell research, and the ways these disciplines imagine the future of the body.
Umbilical Cord Blood

Umbilical cord blood, the 100 or so millilitres of blood retained in the placenta and cord after birth, is an accessible source of hematopoietic stem cells. It has become therapeutically valuable tissue over the last fifteen years because it can act as a substitute for bone marrow transplant in the treatment of blood disorders. Since the 1970s, bone marrow transplant has been used to rebuild the patient’s blood system as part of the treatment for leukaemia, immune deficiency, aplasia and genetic metabolic disorders. Bone marrow is the source of the body’s blood system, and is rich in hematopoietic stem cells. While it is the first choice of treatment for these serious conditions, bone marrow is a recalcitrant tissue. It is located in the innermost recesses of the body and is extremely difficult to source, donate and match. Donation involves hospitalization and an invasive harvesting procedure. Even well matched tissue carries a twenty percent risk of some degree of graft-versus-host disease, which in its most severe form produces liver failure, gastrointestinal bleeding and death (Kline 2001).

By comparison, umbilical cord blood is a more flexible, accessible and generally tractable substance. Cord blood is much easier to match with a recipient because it is ‘naïve’. That is, it is not strongly characterised immunologically and does not mount a strong response when faced with tissue from another body. Hence, cord blood does not have the stringent matching requirements of bone marrow, and even poorly matched tissue does not carry the same rejection dangers (Lockwood 2002). Its harvesting procedure is far less invasive. Cord blood is donated during birth; either in utero, after the cord has been clamped, or ex utero, after the placenta has been delivered. Physical risk is generally considered minimal, although some bioethicists emphasise the risk that staff may have their attention diverted from the mother and child during the process of cord blood collection (Vawter 1998).
While cord blood has these advantages, the relatively small amount of material places limitations on its usefulness. Cord blood is slower to engraft than bone marrow, leaving the recipient vulnerable to infection for a longer period than a successful bone marrow graft (Laughlin, Barker, Bambach et al. 2001). Currently cord blood transplants are used primarily to treat children, as the quantity available engrafts most successfully in smaller patients. Extensive research is in train to develop methods to expand stem cell mass in vitro so that larger volumes can be transplanted (De Haan, Weersing, Dontje et al. 2003, Egan 2000). Cord blood is also the object of extensive interest among stem cell researchers more generally, as a source of non-controversial, non-embryonic stem cells. While cord blood stem cells do not display the same pluripotent repertoire as embryonic stem cells, they have been caught up in the recent general enthusiasm for stem cell research. A range of research, discussed later in this paper, is currently underway to improve the flexibility and capacities of cord blood stem cells, and induce them to behave more like embryonic cells.

**Cord Blood Banking**

Umbilical cord blood is bankable tissue. It can be frozen for ten years or more without significant deterioration in clinical usefulness. Again, this gives it significant technical leverage over bone marrow. Because bone marrow donation is so onerous, donation is only undertaken when there is a definite recipient. Registers of potential donors must suffice, rather than banks of the material itself. Tissue banking facilitates complex forms of tissue manipulation, management and distribution that potentiate the clinical value of the material by increasing its flexibility and durability. Like all tissue banking, cord blood banking produces clinical outcomes through the manipulation of biological time. Freezing preserves the haematopoietic potential of the stem cells. Like embryonic stem
cells, cord blood stem cells are valuable because they partake of the generative capacity of
the prenatal body in both its maternal and fetal aspects, its striking ability to produce and
renew organised tissue. Freezing these tissues removes them from the flow of historical and
biological time, and preserves them so that their potential can be realised at a later date.
Banking turns the generative capacities of the prenatal body into regenerative capacities,
able to revitalize the sick or aging postnatal body. In this respect cord blood stem cells
increasingly partake of the same dream of a regenerative body evident in embryonic stem
cell claims (Waldby 2002), the dream that every biological loss can be repaired.

The New York Blood Center set up the first allogenic cord blood bank in the USA
in 1993, and the London Cord Blood Bank, the first in the UK, was set up in 1996. These
are now among a number of public cord blood banks in the OECD nations. The first private
cord blood bank, Biocyte Corporation, was set up in Connecticut in 1993 (Holden 1993),
and now private cord blood banks operate throughout the USA, Europe and Asia. Public
and private banks use quite different methods for the preservation of cord blood potential.
Public banks create clinical value for cord blood through strategies of accumulation and
genetic diversification. While peripheral blood banks must keep the supply and demand for
their perishable material in equilibrium, supplies of durable cord blood can be built up over
time, and the spectrum of tissue types maximised. The London Cord Blood bank aims to
collect and store 10,000 units (Armitage, Warwick, Fehily et al. 1999). At time of writing,
a bipartisan Cord Blood Stem Cell Act is before the US Senate, designed to create a
network of cord blood banking centers with an inventory of 150,000 units. Public banks
also participate in international registries that aim to find tissue matches overseas if no
national match can be located.

Private cord blood banks create a different kind of value through a very different
accumulation strategy. They sequester cord blood in a personal account, withholding it
from all forms of allogenic circulation. Private banks lease autologous banking facilities to
parents, who pay an annual fee to bank their child’s cord blood for possible future use. Private banks recommend autologous storage as a way to avoid the vagaries of the public cord blood matching process. Private banking, they claim, ensures the child access to a source of perfect matched tissue on demand, and so protects them from the risks of an imperfect match from the public cord blood system. The Mount Sinai Hospital Cord Blood Program website states, for example,

The majority of children will fortunately never need the stored cells. However, some children will have their health severely affected by such genetically transmitted blood diseases as Thalassaemia, Sickle Cell Disease, or some forms of anaemia or immunodeficiency disease. Other children will be stricken with such cancers as childhood leukaemia, malignant lymphoma or neuroblastomas. While childhood cancer is fortunately a rare event, it is the leading cause of death in children between the ages of one and fourteen.

Private cord blood banking has attracted the condemnation of virtually all medical professional and bioethical bodies. They consider that cord blood banking for personal use is not warranted by the very low risk of an individual developing a blood disorder treatable by cord blood transplant. In 1997, the American Medical Association issued a consensus statement describing autologous cord blood transplant as an unproven treatment, and recommending that the marketing practices of private cord blood banks receive more scrutiny (American Medical Association 1997). The American Academy of Pediatrics issued a policy statement in 1999 stating that parents should not store their children’s blood for future use unless there is evidence of family predisposition to leukemia or other blood
It is difficult to estimate the likelihood that an individual directed donation would be used. This applies especially given that many of the projected usages of stem cells remain speculative and subject to research yet to be done. There is also the presumption that treatment advances involving stem cells will be readily available on the NHS. One commercial storage provider estimates that likelihood of a child developing a disease that could be treated by stem cells by the age of 18 years as around one in 300-400. Although stored cells might also be used by other family members, this figure seems a gross overestimate of the probability that a stored cord sample will ever be used. One bank in the USA has to date issued only two units out of 10,000 stored, although this figure may rise with time. At present, it is not possible to conclude that storing cord blood for one’s child will not be of value, although the likelihood that it would ever be used is very low (Royal College of Obstetricians and Gynaecologists 2001: 2).

The French national bioethics commission notes that autologous donation is counterindicated in many of the conditions listed at the private cord blood banks’ websites:

In the case of a genetic disease, it is difficult to understand how such cells could be useful to the patient concerned, since the cells would be carrying the same mutation, unless some presently unknown effective gene therapy were to emerge. For some of these genetic diseases, allogenic grafts, from a related or an unrelated donor, could be indicated. For many haematological

...
diseases, remission or cure also relies much more on allografts than on autografts. For a wide range of leukaemias, the immunological reaction capacity of allogenic cells to factors carried by the leukaemia cells, have a beneficial effect: i.e. the graft versus host leukemic cells reaction.

Autologous cells would not have this effect (Comité Consultatif National d’Ethique 2002: 3).

In other words, the autologous capacity to regenerate self is not clinically desirable in all cases. In genetic conditions, it is precisely the mutated nature of the autologous tissue that is problematic, and in some other blood disorders the effects of allografts are clinically beneficial. Moreover, autologous stem cell treatments in current use are mainly drawn from the patient’s peripheral blood. The report notes that any technical innovation that would potentiate cord blood would also potentiate peripheral blood, so that it would be unnecessary to resort to preserved cord blood in any case.

Despite this concerted condemnation, the market for private cord blood banking services is growing each year (Saywell 2003). Very few studies have investigated the reasons parents use private banking facilities. In a recent Canadian study of 443 women’s attitudes to cord blood donation, Fernandez and colleagues (2003) found that eighty-six percent preferred public cord blood banking, while fourteen percent preferred private. Those who expressed a preference for private banking stated that it was a good investment for the child, and that they felt obliged to secure their child’s cord blood in case of future need. Advocates of public cord blood banking consider that parents who use private facilities are simply misled by the rhetoric of the private banks. However, in what follows, I want to consider other possible explanations for the attractions of private cord blood banking. In particular, I want to unpack the implications of autologous cord blood as an
‘investment’. As we will see, private banks do not transform cord blood into clinical gifts but into biological venture capital.

**Biological Investment**

Private cord blood banking creates a property relationship between the account holder (or at least their trustees, the parents) and their cord blood. It does this both technically and contractually. It leases facilities to the account holder and manages the technical aspects of harvesting and storage; and it creates a legal relation of possession between the unit of cord blood and the account holder. The form of possession it creates is novel in the contemporary field of human tissue biopolitics because it severs questions of property from the issues of commodification that attract the attention of many bioethical critics of the marketization of human tissues (Andrews & Nelkin 2001, Kimbrell 1997, Gold 1996). It effectively avoids the gift/commodity dichotomy that largely structures the field of bioethical debate around human tissues. The account and its contents are constituted as the property of the account holder, but they do not partake of the commodity form - they do not circulate as object of exchange on a market. The value of the cord blood for the account holder resides precisely in its not being alienated, in its perpetual retention, because of its self-regenerating capacities. The account constitutes cord blood as a possession, yet an *inalienable* possession (Weiner 1992), a fragment detached from the self that nevertheless belongs to it irrevocably. For those who open private cord blood accounts, the value of their fragment is entirely lost if it is either given as a gift or sold as a commodity. The account provides a way to pre-empt the claims of others on the fragment and preserve its potential for the future self. At best, the account may be held as a form of family property, opened by parents on behalf of their child and potentially shared among family members, with their higher chance of a tissue match.
In the case of public banks, the value of cord blood is *allogenic*. It conforms to the general logic of gift economies in that its clinical usefulness arises at the point of redistribution, when it is transferred from one person to another. The private account creates value for the account holder in precisely the opposite way. It allows the depositor to retain exclusive control and use of their cord blood, on the grounds that its value is primarily *autologous* and *autopoietic*. It can remake a part of the account holder’s body, ideally at least. Banking the tissues privately, diverting them from allogenic networks of gifting and redistribution, is a way to coordinate the self-generative capacity of the cord blood with the aging body of the account holder. It allows them to live in a double biological time. The body will age and change, lose its self-renewing power and succumb to illnesses of various kinds. The banked fragment, frozen and preserved from deterioration, retains its negentropic, autopoietic capacity. If need arises and clinical circumstances permit, it can literally remake a crucial part of the account holder’s body, their blood system.

The private cord blood account then is a form of property whose value is oriented towards the biological future, both the future health of the account holder, and the future of biotechnology more generally. This future orientation qualifies it as an investment, rather than an inert possession with a stable value. The marketing strategies of private cord blood banks emphasize both the prudential and speculative investment value of a private account. In its prudential aspect, a private cord blood account is organized according to the neo-liberal principles of private insurance, which offers personalized risk-management services as a hedge against the uncertainties of the future. Public cord blood banking works through the collectivization of health risk management, its distribution throughout the population on the grounds of capacity and need. Private cord blood banking follows the principles of private insurance - risk segmentation, unpooling and personal risk-management strategies (Ericson, Barry and Doyle 2000). Hence private cord blood banks market their advantage
over public banking as the avoidance of uncertainty involved in resort to the public system, the possibility that no donation is exactly right for your child. This advantage is described explicitly as a form of insurance, taken out by the good parent to safeguard their child’s future. So for example, the Mount Sinai Hospital Cord Blood Program states that banking cord blood provides ‘biological insurance: painlessly obtained, immediately available, perfectly matched cells for your child’14. Lifebank Cryogenics Corporation states that it ‘offers families biological insurance. Our facility stores the valuable umbilical cord blood for the families [sic] exclusive use’15. A private cord blood account offers the client a form of biological security not obtainable in orthodox insurance. Disability insurance substitutes a capital value for bodily loss. Private cord blood banking promises to repair bodily loss itself, or at least certain kinds of loss, those associated with diseases of the blood.

Private cord blood accounts are also marketed as a form of speculative investment, one whose use-value might multiply in unforeseeable ways in response to new biotechnologies. This aspect of cord-blood banking has gained particular impetus from the field of regenerative medicine described at the beginning of this paper. In particular, it has gained impetus from the rapid innovations and substantial public and private investments made in the field of stem cell research (Salter 2005). Hematopoietic stem cells do not display the pluripotent versatility of embryonic stem cells in current technical conditions, nor can they be cultured into cell lines. Nevertheless, considerable research is underway to find better ways to enhance cord blood and bone marrow stem cell capacities and confer them with the same aura of potential as embryonic stem cells. Research is being conducted to find ways to culture cord blood stem cells so that they can be ‘expanded’ in the same way as embryonic stem cell lines (Egan 2000) and to induce transdifferentiation into multipotent stem cells, rather than stem cells committed solely to the production of the blood system (Anderson, Gage & Weissman 2001). Bone marrow cells are currently being
used in small clinical trials around the world to rebuild cardiac tissue after heart failure, for example (Hirschler 2003).

Private banks increasingly emphasize this open-ended nature of stem cell research. In a recent interview with the Director of Cryosite, an Australian private cord blood bank, he states, ‘if you look at the [publicity] material we have produced carefully, you will see that we have not over-emphasised the use in leukaemias. We emphasise much more the long term future applications of the earliest form of adult stem cells’\textsuperscript{16}. An interview with scientific staff at CORD, a private cord blood bank in California, makes a similar point:

‘What happens . . . when, say, diabetes can be cured with a cord blood stem cell transplant?’ asks Cohen. ‘In another five years, I believe cord blood would become more commonplace’. But if and when it does become commonplace, there would be no way of going back and collecting cord blood samples from those [already] born. ‘You miss the chance if you decide to throw out the cord blood’, said Dr. Joy Traille, lab director at CORD (Raghunathan 2001).

The Mount Sinai Hospital program points to the possibility that gene therapies may make use of cord blood stem cells in the future. ‘New gene therapies are being developed that may depend on the use of cord blood stem cells to treat diseases that are presently difficult to treat or incurable’\textsuperscript{17}.

Parents are urged to seize the moment and create a private cord blood account for their child, in an act of open-ended hope in biotechnical progress. In particular, they invest in the possibility that cord blood will achieve the plasticity of embryonic stem cells, with their apparently endless, pluripotent possibilities for multiplication and recapacitation. As Cooper (2006) notes, the rhetoric around stem cells, and indeed the material organization of
immortalized stem cell lines, constantly affirms the open-ended possibilities of these new entities. Stem cells acquire their value in a speculative, virtual realm, in projections of possible therapeutic applications and possible new repertories of activity and agency. Those who hold private cord blood accounts take an active stake in such future biotechnical developments, and the possibility that they will progressively enhance the value of their cord blood investment in innovative ways.

**Conclusion**

Among the medical organizations critical of private cord blood banking, the French national bioethics commission makes the most explicit link between different models of banking and the formation of social order and citizenship. Their report states,

> Preserving placental blood for the child itself strikes a solitary and restrictive note in contrast with the implicit solidarity of donation. It amounts to putting away in a bank as a precaution, as a biological preventive investment, as biological insurance, whereas the true usefulness of the action in the present state of scientific knowledge, may be negligible.

. . . There is major divergence between the concept of preservation for the child decided by parents and that of solidarity with the rest of society. Systematic auto-preservation, unless for exceptional medical reasons, is a denial of donation and an obstacle to the creation of banks for others which would require very costly prior immunogenetic identification. ... It appears that systematic storage of placental blood for exclusively autologous uses, in the present state of medical science, would be illusory, and more closely
connected to market objectives than to therapy (Comité Consultatif National d’Ethique 2002: 7-8).

The commission appeals to the generosity and social sense of the cord blood donor, their duty of citizenship and their desire to avoid a poor investment. Do not waste cord blood by hording it inappropriately, they plead. In the tradition of Titmuss, they assert that the relationship between person and biological fragment is not simply of clinical interest, but has broad implications for the shape and order of the polity, its collective or privatised ethos. Hence, they appeal to a particular order of medicalized subjectivity, a particular kind of bioethical citizenship associated with the post-war nation-state and its commitment to universal and redistributive medical care.

However, their appeal is weakened, I would argue, by its location in a set of state commitments and civil relations which have come under enormous pressure from the large transformations associated with globalisation, the decline of the welfare state and the neo-liberalisation of health care. Commentators on globalisation and the nation state like Jessop (2002) and Cerny (1997) argue that contemporary states can no longer martial the strong identification of their citizenry with the fate of the nation, the imagined community of the nation-state described by Anderson (1991). Rather the social policy transformations associated with the public fiscal crises of the 1970s, and the shift to post-Fordist knowledge economies and the dissemination of neo-liberal ‘solutions’ since the 1980s have involved,

A shift in the focal point of party and governmental politics away from the general maximization of welfare within a nation (full employment, redistributive transfer payments and social service provision) to the promotion of enterprise, innovation and profitability in both private and public sectors (Cerny 1997: 260).
This new focus on competing in the global economy, and the weakening of national boundaries as discreet spaces of economic activity, citizenship and governance, complicates the ways citizens relate to national institutions. Their loyalties and identifications are multiplied through migration, transnational communications, global media and branding, and the vicissitudes of survival in increasingly marketised societies. The political focus on global markets ‘hinders the capacity of state institutions to embody the kind of communal solidarity or Gemeinschaft which gave the modern nation-state its deeper legitimacy, institutionalized power and social embeddedness’ (Cerny 1997: 251).

In consequence, the kind of social solidarity and identification with the fate of the nation advocated by Comité Consultatif is increasingly difficult to marshal. In particular, citizens faced with declining national health systems and increased marketisation of health services are less and less inclined to identify with a general public health based on public institutions and gift relations. Rather the field of medical citizenship has itself undergone specific transformations, exemplified by the private cord blood account holder, for whom new medical technology and health consumer services are a means of transforming their body into a strategic enterprise. Novas and Rose (2000) describe this neo-liberal medical subjectivity as an active response to the devolution of medical care from the state to private provision. Health is less a matter of collectivised citizenship and identification with the nation, and more a relationship of active, critical stake holding and consumption, organised around, the norms of enterprising, self-actualising, responsible personhood that characterize ‘advanced liberal’ societies, and with the ethics of health and illness that play such a key role in their production . . . these new forms of subjectification are linked to the emergence of complex ethical technologies for the management of biological and social existence, located within a
temporal field of ‘life strategies’ in which individuals seek to plan their present in the light of their beliefs about the future that their genetic endowment might hold (Novas & Rose 2000: 488).

This neo-liberal medical subjectivity is oriented towards the entrepreneurial maximisation of future health, an enterprise enabled by burgeoning markets for various kinds of presymptomatic testing (for diabetes, cholesterol, genetic conditions, neurological conditions), preventative pharmacology (anti-aging drugs and vitamins) and enhancement medicine, that addresses not illness but perceived bodily deficiencies (obesity, metabolism, sexual performance). Hence, it is deeply invested in new medical technologies and their proposed futures for the body. As Novas and Rose (2000) observe, this mode of subjectification is oriented towards norms of personal responsibility, risk assessment and informed decision-making, rather than the norms of participation in collective population health invoked by the national bioethics commission.

In my analysis, private cord blood banking is one of the technologies and industries that call this mode of subjectivity into being. Its form of investment appeals not only to a generalised parental prudence and credulity, but also to these new norms of entrepreneurship, risk management, and collaboration with the future of biotechnology. Doubts about the current clinical value of a cord blood account are outweighed by its potential, speculative value, as a source of autologous tissue that might be profitably deployed in relation to new stem cell or genetic techniques. In the words of one account-holder, ‘I think it’s quite clear that this technology is moving very quickly, and for not a huge amount of money, in fact quite a small amount of money, it’s a good punt’18.

This calculus, it seems to me, is the reason that the clinicians’ warnings go unheeded by a certain percentage of cord blood donors, those who elect to use private facilities. The private account allows the account holder to deploy their child’s tissues in
productive ways without giving them away, losing them to commercial interests or being placed in a position of indebtedness to another donor. If, as Frow (1997) argues, the social relations that order gift and commodity economies are ‘intimately bound up with forms of the person’, then the novel form of self-possession proffered by private cord blood banking point decisively towards such an emerging mode of medical subjectivity.

It seems likely that private cord blood banking might form something of a prototype for other kinds of autologous tissue banking, as the field of regenerative medicine expands. So for example, recent dental research suggests that parents should keep their children’s baby teeth, as their pulp may be able to regenerate dental tissue in the adult mouth. Therapeutic cloning, in its earliest experimental stages at time of writing, is likely to produce a market for private cell line banking if the technology becomes more routine. Cloned pluripotent cell lines promise to be the ultimate self-renewal technology, but the high cost of establishing such lines is likely to exclude such practices from national health budgets and render them the prerogative of the wealthy. The steady aging of populations in the OECD nations creates a large potential market for the possibilities of regenerative biology. As Neilson points out, this potential market is currently motivating much biotechnical research.

There can be little doubt that the intensity of capital investment in this sector, which now drives the economy of certain subnational regions (such as the Boston/Cambridge area in the United States), relates to the expectation of high returns as new technologies of rejuvenation become marketable to an aging population (Neilson 2003: 181).

Regenerative medicine promises that the body can become the source of its own self-renewal, an attractive prospect for wealthy, aging populations seeking better
techniques of biological self-enhancement and safeguards against degenerative disease. Just as these populations must provide for their own financial future through private pension investment, so too may they provide for the future of their bodies through the investment of autologous biological material. Each practice suggests a personalised, demutualised vision of the future, in which prudential self-management and self-investment will yield enduring financial and biological security.

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Biographical Note

References


Notes

1 Non-mammalian animals, particularly some insects, worms and lizards, have a wider repertoire of self-regeneration, and are able to grown new tails, limbs etc. Some can even recover from bisection.

2 See http://www.aastrom.com/default.asp accessed May 6, 2005

3 Caritas St. Elizabeth's Medical Center of Boston.

4 http://www.ortecinternational.com/~johncapa/index.php

5 For example, a clinical trial carried out at the University of Colorado in 2001 used foetal mesencephalic tissue to culture up dopamine-producing neurones that were then implanted in the brains of twenty patients with severe Parkinson’s disease. After initial improvement, five of the 20 implanted patients deteriorated dramatically, developing dystonias and dyskenesias, hyperactive, disabling contractions and uncontrollable movement (Freed et al. 2001).

6 I have used the idea of the biomedical imagination elsewhere in my work (Waldby 1996 & 2000) to refer to ‘the speculative, propositional fabric of medical thought, the generally disavowed dream work performed by biomedical theory and innovation. It is a kind of speculative thought which supplements the more strictly systematic, properly scientific, thought of medicine, its deductive strategies and empirical epistemologies’ (Waldby 2000: 136).
The exceptions here are kidneys – one can be donated and the other kept – and liver lobes, which regenerate.

I refer here to the impact that the globalization and privatization of the blood plasma supply had on national blood banking systems in the early 1980s, introducing HIV contamination via blood products. The blood contamination scandals of the mid to late 1980s have combined with the general erosion of nationally-based, public sector health institutions to reduce public trust of the blood banks. More broadly, the dynamics of globalization, post-Fordism and the opening of national economies to global finance markets have weakened nationally-based forms of political participation, trust and identity (Jessop 2002). For an extended treatment of the relationship between tissue banking, globalization, citizenship and public trust see Waldby and Mitchell (2006).

Blood requires tissue typing, but is much easier to match than most other transplantable tissues.

National Marrow Donor Program (USA) website - http://www.marrow.org/ accessed 29/03/04

National Marrow Donor Program (USA) website - http://www.marrow.org/ accessed 29/03/04

See www.mtsinai.on.ca/cord_blood/faq; accessed 31/12/03.

For more on the gift/commodity distinction and its limitations in the debates around human tissues, see Waldby and Mitchell (2006).

See www.mtsinai.on.ca/cord_blood/faq; accessed 31/12/03.


Interview with Ron Penny, for the Catalyst program, Australian Broadcasting Service Television, 25th September 2003.

See www.mtsinai.on.ca/cord; accessed 13/02/03.

Interview with the father of a child whose cord blood had been banked at Cryocite for the Catalyst program, Australian Broadcasting Service Television, 25 September 2003.