Technology Analysis & Strategic Management
Vol. 18, Nos. 3/4, 313–327, July–September 2006

Routledge
Taylor & Francis Group

Blood Ties: Banking the Stem Cell Promise

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ABSTRACT *This paper explores the banking of cord blood stem cells by new parents, a growing phenomenon that raises a number of questions for scholars interested in the role of expectations in innovation. In particular, we focus on the relationships between imagination and materiality, the way in which today's expectations of a future stem cell revolution have become embodied (materialised) in an ever-growing number of deposited cord blood samples. In addition, the case raises interesting questions about agency and authorship in the construction of the stem cell dream and the production of new 'blood ties'—new future-oriented parental duties and responsibilities. Here, parents are encouraged to think themselves into a future in which their newborns are 'at risk', but also a future populated by an innovative range of regenerative medical treatments.*

Introduction

Blood, like so many other bodily substances today, has become a 'promissory matter'. It is now the bearer of a whole range of anticipatory claims and has been substantially reconfigured in hope and expectation. By substantially, we mean that the very substance of blood is now the site of a highly complex corporeal innovation process that connects stem cell innovation and tissue engineering with the globalised worlds of umbilical cord blood banking, gene therapy, bone marrow transplantation, blood storage and transfusion.

This paper explores the banking of cord blood stem cells by new parents, a growing phenomenon that raises a number of questions for scholars interested in the role of expectations in innovation. In particular, we focus on the relationships between imagination and materiality, the way in which today's expectations of a future stem cell revolution have become embodied (materialised) in an ever-growing number of deposited cord blood samples. In addition, the case raises interesting questions about agency and authorship in the construction of the stem cell dream and the production of new 'blood ties', new

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0953-7325 Print/1465-3990 Online/06/3–40313–16 © 2006 Taylor & Francis
DOI: 10.1080/09537320600777044

parental duties towards the future. Here, parents are encouraged to think themselves into a future in which their newborns are 'at risk', but also a future populated by an innovative range of regenerative medical treatments.

Not all promissory matters are equal. In the wake of the embryonic stem cell debate, blood stem cells (Haematopoietic Stem Cells, HSCs) have of late come to be known as the 'other stem cell' or an 'alternative source' of stem cells, itself illustrative of the way different matters are comparatively ranked against each other in order of promissory importance. The ascendancy and intensity of expectations surrounding embryonic stem cells (hESCs) has of course dominated both the policy agenda, and also social science commentary and critique too, and not undeservedly. Nevertheless, the attention focussed on hESCs has distracted from very sizeable cultural and technological activity in other areas of tissue engineering, and blood stem cells in particular.

At the forefront of these dynamics, numerous companies have been established throughout the world since the mid 1990s, having identified a commercial market in the banking, expansion and processing of HSCs from cord blood, for use in treatments both real and imagined, but mainly imagined. Expectations of future medical breakthroughs in stem cell therapy have been crucial in mobilising the financial and policy investment necessary for the formation of these innovative networks. Pluristem Inc., one of the many companies currently developing methods to expand specific populations of cells for use in a variety of contexts, including tissue engineering, bone marrow transplantation and gene therapy, estimates the potential global market in HSC cell expansion at US $8 billion. Wrapped up in the following statement—from the company's publicity information—can be found the many successive layered histories (bone marrow transplantation, gene therapy, tissue engineering, etc.) that together constitute the promissory potential of HSCs:

> HSCs have a greater self-renewal and differentiation capacity than any other adult tissue and hold the promise of being able to repair or replace damaged cells and tissues. Bone marrow transplants are ultimate treatments for many pathological conditions . . . . HSCs . . . serve as a primary target for gene therapy . . . . The Company believes that the stem cell expansion services . . . will double the existing growth rate of the number of CB [cord blood] donors for personal use, i.e. parents storing the CB for their children's future.

Much more prominently than cell processing/expansion services, the banking of cord blood has been central to the construction of stem cell expectations, and just as central in brokering new corporeal-commodity relations and markets that connect new parents with emerging biomedical industries. Cord blood banking is advertised directly to parents as an investment that may, one day, prove to save the life of their newborn child. Potential 'investors' are implored to, as banks varyingly express it, 'put a little something away for a rainy day'; to provide 'a security blanket for your family'; by 'saving key components to future medical treatment'; or 'saving something that may conceivably save his or her life someday'. As another company, CryoBank Inc. explains:

> By storing your baby's umbilical cord blood with California Cryobank Stem Cell Services, you are safeguarding the future health of your child by providing your baby with a lifetime of insurance needed to take advantage of today's medical breakthroughs and tomorrow's discoveries.

This is a sector that has prospered enormously from both web-based as well as more traditional forms of advertising and information dissemination to new and prospective parents. For example, the UK's Bounty organisation, marketing thousands of childbirth products to parents, regularly features advertising from commercial cord blood companies and is thought to reach roughly 90% of the UK antenatal population. Many of the messages from cord blood banks have been highly controversial and heavily criticised for being misleading by suggesting that HSCs can, 'only be collected at birth'; they are 'a once in a lifetime opportunity'; that 'it's like freezing a spare immune system', etc.[1]

The cost of storage can vary considerably between £400 to £1300 for the initial collection and deposition, with fees to pay per year for the 'lifetime' of the sample thereafter. Haematopoietic stem cells are saturated with the languages and metaphors of banking, saving, investment and insurance, the deposition of biological assets that should accrue value and worth over the passage of time, as the twin futures of medical progress and disease risk are drawn nearer to the present.

By way of background, cord blood HSCs have been of clinical interest since 1988 when they were successfully used as an alternative to bone marrow in the treatment of Fanconi's anaemia.[2] This led to various public sector initiatives in the early 1990s to bank cord blood for transplantation between unrelated though closely matched donors and hosts (allogenic transplantation). The fact that these are unrelated transplants is important because if a person's own cord blood were to be used (autologous transplantation) the transplant may well reintroduce cancerous cells back into the body, even after their successful removal during chemotherapy. Since the late 1980s, CB transplants have also been used in the treatment of a number of other rare immune deficiency diseases.

Much of the public—as opposed to commercial—cord blood sector is aimed at collecting the CB of rare immunological types—particularly ethnic minorities—for whom it is often difficult to find a conventional bone marrow donor. In the UK, new parents are not normally offered the option of donating CB to the National Blood Service's Cord Blood Bank. The only exceptions to this would be if expectant parents were being treated at one of the few maternity centres where collection takes place and usually only if the family are of minority ethnic origin, or at risk of developing other rare disorders treatable with CB stem cells.

Alongside public sector banking, commercial cord blood banks have been offering new parents the option of storing the cord blood of their newborn, for later use in treating their child should it develop one of a long list of diseases cited by cord blood banks, or for treating siblings and other family members. The chances of a child's own cord blood being used in the treatment of leukaemia is, as we note above, considerably reduced because of the risks that the banked stem cells will themselves be cancerous. Also, one recent study noted that there are no more than five instances of the autologous use of cord blood stem cells mentioned in the scientific literature (for neuroblastoma, aplastic anaemia and retinoblastoma).[3] Not surprisingly, estimates differ markedly on the future possibility that banked CB cells might be used in the allogenic treatment of closely related family members or the autologous treatment of the child. While the commercial banking industry usually cites figures in the region of 1 in 400 over the course of a child's first 20 years, more conservative estimates put the figure at closer to 1 in 20,000 or more.

Whatever the statistics on the actual frequency with which CB is used in the clinic, it is interesting to note the significant differences in emphasis and strategy between public and private CB banks. In short, while the commercial sector cites future developments in tissue

engineering as a primary reason for investing in CB banking, the public sector, in contrast, focuses almost exclusively on the present day use of CB HSCs in treating very rare blood and immunological disorders, and also in rare instances where a bone marrow transplantation is not possible.

It is very difficult to gauge the current size of the market in the commerical storage of HSCs by families. A review of the cord blood sector completed in 2003 estimated that there were roughly 100 cord blood banks operating worldwide, with the commercial collection of cord blood accounting for roughly 25% of global CB banking activity.[4] There are presently nine commercial cord blood companies operating in the UK.[5] One of the UK companies interviewed as part of our research was prepared to say that, after two years of operation, they are now storing close to 2000 samples representing income of around £2.6 million since their launch—though, according to our respondent, these numbers are disappointing by comparison to initial predictions for the likely size and growth of the market.

In what follows, we want to unpack some of the promissory dynamics in play in the worlds of cord blood banking, drawing on a range of primary and secondary data including interviews with parents considering depositing the cord blood of their newborns, plus respondents from both commercial and public cord blood sectors. In making sense of the dynamics of expectations in this field, we draw on a number of key salient themes. Each of these themes are offered here as a means of 'making sense' of cord blood banking. First, cord blood has lately been subject to processes of 'capitalisation'[6] or 'bio-value'[7] whereby bodily matters are invested with future worth, a present and future value chain connecting new parents, the clinic and the market. Second, cord blood banking can be seen to be mediated by what recent scholars of clinical innovation have referred to as a 'political economy of hope'[8] where aspirational emotions and affectivity are central to debate. Just as importantly, the storage of bodily matters like cord blood, embryos, ova, semen, etc., prompts searching questions about the role of biomedical services in reordering and extending kinship and family ties, or more accurately, *blood ties*. Our fourth way into the dynamics of expectations surrounding CB banking is to explore its links to health insurance, a simultaneously metaphorical and material indemnity against some unspecified, though feared, future disease disaster. Finally, we want to explore questions of agency, how it is that we can document the orchestration and production of expectations.

On Capitalisation—Embodiment and Disembodiment

To 'put something away for a rainy day' (as expressed by SmartCells Inc.), by banking cord blood is but the latest twist in the capitalisation of biology, an investment that might or might not one day come to fruition. Capitalisation expresses a number of different processes here, but primarily the way promises and expectations work to link the present and future value of biological investment.[9] It is in these terms that Charris Thompson writes of 'promissory capital':[10]

> the biotech mode of (re)production will have, and is already beginning to have, its own characteristic systems of exchange and value, its own notions of the dimensions we currently think of as time and space, its own epistemic norms, its hegemonic political forms, and its own hierarchies and definitions of commodities and personhood. (p. 5)

For Thompson, if industrial capitalism was seen to alienate oneself from one's labour, today it is one's biology and its tissues (blood, eggs and organs) as well as monetary capital that are the object of alienation in the contemporary capitalisation of biology. Cord blood is the corporeal link in a novel value chain connecting parents and the future of their newborns with an emerging industrially and globally oriented biological service. Much of this, as the extracts below show, depends on a restructuring of the expectations shared between healthcare providers, 'private consumers' and healthcare markets.

> . . . the GP said, 'You know I suppose given the fact you're only talking about £1000, £1500 if I had the opportunity to do it now', she said, 'my children are what 8 and 10 or whatever', she said, 'at that price I would probably look to do it'. But she said, 'You know it's a personal matter and I don't know very much about it, I think it's something that you probably need to go away and research and make your own mind up on'. (Female CB parent—CDP1 March 2005)

The 'cord blood debate' largely revolves around the contrast between public banking and its ethos of altruistic donation in which cord blood becomes available for the 'allogenic' treatment of others, and commercial banking in which parents deposit stem cells for their own exclusive use or the 'autologous' use of their child, in this sense remaining their property. Capitalisation here can be seen to take the form of a shift away from the shared public ownership of a collective future resource and towards a greater privatisation of the storage of tissues for personal use and also commercial profit.

This clearly maps on to wider dynamics in which futures and expectations attached to the banking of bodily matters are linked to these opposed goals and aspirations, namely donation ('gift') and personal banking, and ever weaker distinctions between public and private in the contemporary tissue economies.[11] The privatised banking of cord blood is taking shape in the context of significant anxieties about the changing status of gift and giving and sustained attempts by public policy to shore-up voluntary unpaid donation as the legitimate basis of public blood services. Nevertheless, values such as these are often at odds with the incredibly blurred engagement of public sector blood services with commercial biology. Helen Busby, in her work on the UK National Blood Service notes that while most donors are motivated by notions of solidarity with the recipients of their 'given' blood, this is far removed from the highly industrialised conditions by which blood is processed, broken down into components, re-assembled, tested, stored, traded across national borders, and used in medical research.[12] She notes how difficult it has been for the UK to maintain its adherence to voluntary donation, especially when having to import blood products (blood plasma for instance) from contexts like the US where 'donors' receive cash payments. Despite this blurring of gift and commodity, public and private, the perceived threat to the principle of solidarity remains one of the strongest public policy criticisms of the new and emerging commercial CB banking sector. As several recent reports by national and European bioethics committees express it:

> Such banks raise hopes of utopia and disguise a mercantile project using assistance to children as a screen. The gravest danger is for society in so far as setting up such banks is likely to contradict the principle of solidarity, without which no society can survive.[13]

> Tissue banks were up till now relying on free donation for treatment to the benefit of other persons or for research, and by the fact that it implies an act of solidarity or generosity it contributes to the social cohesion, while the commercial cord blood banks are running for profit. This reflects a more general shift to a privately funded health care sustem from a health system based on solidarity and motivated by public health considerations, which has characterised Europe in the last decades. (European Group on Ethics in Science and New Technologies, 2004)

Also at issue here are a range of other questions about managing and resourcing commercial activities in public healthcare contexts like that of the UK's NHS. As the following extract shows, this varies considerably across different healthcare systems. In particular, to what extent can maternity services be seen to engage with the highly capital intensive and commercialised childbirth sector? Most commercial CB banks recommend that the collection of cord blood be undertaken by an experienced medic in attendance at the time of birth. In some situations agreements have been made to 'compensate' maternity services for the additional resource demands that collection brings with it. The problem for all parties here is that payments made to maternity units might be seen to put them in the position of acting as 'agents' in selling commercial cord blood banking to parents and newborns in their care:

> . . . my aim is to facilitate collection for those parents who wish to do it . . . and my biggest problem is maternity units saying we can't do that . . . it's the sort of problem that America never had . . . and I think part of it is because we have the NHS and it's an extra job for them to do that they're not going to get paid for . . . my way forward is to say this isn't an NHS procedure and for the hospital to request a charge from the parents. We have now got a couple of hospitals doing that . . . it will be driven by patient demand . . . . I don't want to induce anybody to do anything because I need them [maternity unit] to remain neutral . . . and parents need them to remain neutral . . . .
>
> If they [hospital Trusts] choose to make a charge for the collection rather than actively promoting it then that's up to them . . . and we could make that payment and refund them . . . in New Zealand cord blood banks pay the practitioner for every successful collection . . . which does have a positive effect in terms of the fact that they're careful with their methodology and that they always collect enough blood . . . and I don't mind inducing people that way [through payment] but the last thing I want them to start doing is saying to parents 'you must store your baby's blood'. (Commercial CB Bank Marketing Director 1)

Much of the above concerns the way new market relationships are being organised between healthcare consumers, providers and biological services. As the last extract points out, there are tensions in the risk of financial inducements to maternity services leading to the potential miss-selling of the stem cell promise to new parents. Just as crucial here is the way CB banking in both public and private sectors operates as an ancillary extension to other kinds of activities including those of stem cell research for regenerative medicine, new cryogenic biobanking services for the storage of whole range of tissues and cells, laboratory devices manufacturing, and other aspects of recent biological industrial activity. While many questions about the place of CB banking in

these networks remain, it is clear that research relationships are being forged between banks and basic research communities. Gunning makes mention of a number of initiatives that have seen the formation of biotech research companies around the availability of HSCs in commercial cord blood banks for secondary research purposes, above and beyond their use for future treatment by depositors.[14]

On Hope and Affectivity

Cord blood services are at once highly abstract in terms of the remote deposition of stem cells for a cash payment, and yet also highly affective and inter-subjective in the actions and experiences of parents concerned to 'do the right thing' by the future. At the centre of these debates are whether or not, and in what ways, new parents are being subject to some form of emotional manipulation during the anxieties of childbirth.

> I think in the family, certainly mothers specifically are actually in quite an emotional state and quite vulnerable during pregnancy. (Interview with the director of a public cord blood bank—March 2005)

Whether or not manipulation is or is not taking place, what is important here is the way expectations are being understood and framed as affective, futures with emotional resonance. This connects with an emerging literature on the biosciences and other areas in which affectivity is seen to mediate future oriented actions in the present. For instance, DelVecchio Good writes of the 'political economy of hope' in the high-tech clinical context of US cancer care and research. For her, it is a discourse of hope—a shared culture of images and understandings about the promise of medicine and the importance of personal and collective action in the face of potential pathology—that links together networks of clinical scientists, oncologists, patients, venture capitalists and wider public political actors. Here, healthcare consumers are seen to make investments in 'medical imagery', what she calls a 'possibility enterprise … culturally, and emotionally, as well as financially'—and we may add corporeally in terms of the hopeful deposition of blood and cells—'… enthusiasm for medicine's possibilities arises not necessarily from material products with therapeutic efficacy but through the production of ideas, with potential although not yet proven therapeutic efficacy'.[15]

More recently, work on the political economy of hope has been taken up by Novas in writing about the collaborative relationships of patient advocacy organisations and pharmaceutical innovation,[16] and previously by Brown's work on hope and the emotions as a mode of ordering in transplantation.[17] Raising again the theme of capitalisation (see previous section), the sociologist of markets, Jocelyn Pixley writes of the behaviour of market traders by combining literatures on the abstraction of economy (the sociology of money) and the 'anticipatory emotions' of trading and traders (the sociology and anthropology of emotion).[18]

In terms of the dynamics of expectations, affective aspirational discourse ('hope') can be seen to facilitate powerful processes of recruitment in the context of modern medical biology. It is worth mentioning at this point broader perspectives from within the post-structuralist anthropology of emotion, providing an important context for the scholarship on hope cited immediately above. Here, much of contemporary Western culture is taken to regard emotions as highly naturalised dimensions of

experience—emotions are pre-rational, instinctive, pre-cognitive and individualised.[19] Because of their essentialised treatment in most popular and academic discourse, emotions like hope are infused with authenticity and derive considerable rhetorical value as a consequence. It is, we might say, hard to argue against the authenticity and genuineness of aspirations couched in affective terms like hope and desire. These are, as Michael Taussig notes, key subjective features of both disease and the organisation of medical technology: 'above all, it is with disease, with its terrifying phantoms of despair and hope that my body becomes ripe as little else for encoding that which society holds to be real' (p. 4).[20]

As we have seen, commentary and debate on the commercial banking of cord blood centres on the legitimacy and status of appeals to the emotions in forging highly privatised relationships between new medical consumers and providers. People considering cord blood banking are often represented—and to a certain extent represent themselves—as emotionally vulnerable to persuasion at a time of high anxiety and insecurity about the immediate experience of childbirth itself, and also their responsibilities to the future of their new child.

> ... for me it feels like clearly ... they're trying to get at all your health insecurities ... all your kind of familial health problems, so they're trying to tick as many boxes as they can it feels like ... those kind of emotional insecurities you might have about your health and your family's health .... I'm kind of intuitively uncomfortable about this notion that it's emotionally coercive you know this business that you know if your kid had leukaemia would you spend £1500? Yes, of course, absolutely, you would in that situation. But I'm kind of intuitively suspicious and uncomfortable with the idea of feeling emotionally coerced to make a decision that I wouldn't make you know in all rationality. (Male CB parent—CDP1 March 2005)

> ... my feelings are that yes whilst it's what between £1000 and £1500 it's not a lot of money if for example, and I appreciate that the chances of ever actually needing it are very small but in terms of this particular child developing childhood cancer, leukaemia, that it may be of some use. I'm perhaps quite emotionally involved .... (Female CB parent—CDP1 March 2005)

Clearly then, the status of emotion and its instrumental utility in the context of banking is a site of acute tension. As the above extracts indicate, a number of respondents talk about the 'fine line' between emotional manipulation and legitimate precaution against the possibility—however unlikely—of the future clinical utility of banked cord blood. Nevertheless, as we go on to discuss below in relation to the question of agency, it is important to caution here against a portrayal of passive 'victimhood' by assuming that people are not also possibly exercising potentially very empowering forms of consumption and engagement with new products and services.[21] This brings us to the next theme that we would like to take up in exploring the way in which cord blood banking becomes a new site for the extension of kinship and family.

On Blood Ties

Interviews with parents who have either already deposited cord blood or are wrestling with the decision to do so, offer an insight into some of the acutely difficult and ambivalent tensions facing an increasing number of new parents. Healthcare decisions are rarely taken in isolation from a whole range of familial and personal considerations in which kinship, family and blood ties play a crucial role.

This meshes strongly with the increasingly geneticised causality of disease for people making sense of their own future risk and that of their kin, but in the context of broader process of expectation and future uncertainty. These highly familial understandings of disease and causality are particularly evident in the work of people like Rayna Rapp,[22] Kaja Finkler,[23] Lindsey Prior[24] and others.

Like much else in medical technology, innovation in CB banking plays an important role in the manufacture of future risk. When Lindsey Prior *et al*.[25] write about cancer genetics, they do so by situating the production of risk not simply in the encounter between patient and doctor, but in the context of a whole panoply of supporting devices and practices—charts, diagrams, healthcare information—through which risk becomes visible. Just as importantly, notions of heredity and inheritance—especially in the context of causally complex multifactoral disorders—make room for new uncertainties about future familial disease risk.

Nevertheless, the open-ended vagaries of heredity and disease provide for a proliferation of meaning-making about future risk. Cord blood banking builds on just such associative understandings by translating banked HSCs into potentially remedial treatments for wider family members as well as that of the newborn from whom cord blood has been taken. Not insignificantly, cord blood banks present themselves as custodians of a 'family asset', making strong reference to themselves as family cord blood banks. There are of course no guarantees that banked cells will be an ideal immunological match for other family members should they be needed, but there is always the possibility. In another twist on this theme, CB banking would, according to some of the commentary and advertising, make an ideal gift from new grandparents and other relatives.

> NB: private cord blood banking is essentially an autologous rationale isn't it? In terms of the CB being used for the child from whom it has been taken?
>
> X: No . . . we call ourselves a 'family cord blood bank' . . . and you pay on the understanding that either yourselves or your family members might benefit . . . and you might get to the end of 20 years and decide you want to donate them to a public bank . . . but we anticipate people will want to continue storing them because science is moving on quite quickly . . . the government is heavily investing in stem cell research both embryonic and adult . . . .
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> (Commercial CB Bank Marketing Director 1)

A crucial point being made here is that futures and expectations are more than just relational and inter-subjective, they are 'intercorporeal' as Susan Waldby[26] (drawing on Weiss[27]) puts it. That is, depositing stem cells involves a highly material and yet symbolic stake in the future potential of an investment to protect families from disease, and cord blood banks have been anxious to stress this in their marketing.

In the following extract, an expectant mother talks about the diagnosis of colon cancer in her father and Alzheimer's in the mother of her partner, both of which have become factors in the decision to bank the cord blood of their new baby:

> . . . because obviously the situation that my dad finds himself in at the moment you know I would dearly love to be able to assist if in any way at all. . . . But facing that, you know having to deal with that certainly puts the, you know this whole issue of potentially storing stem cells into a different context, both you know cognitively and emotionally as well . . . . (Female CB parent—CDP1, March 2005)

As with other bodily matters, cord blood has a 'social life' that runs in parallel to, though physically removed from, kinship ties. Like embryos, HSCs can be understood to have frozen kinship potential, suspended in a liminal moment between the present and the future (see also Bharadwaj[28]). Ready and waiting, banked cord blood offers some assurance, that families can one day draw upon their own stock of cryopreserved of stem cells—however unlikely this might be.

On Corporeal Indemnity

> By storing your baby's umbilical cord blood with California Cryobank Stem Cell Services, you are safeguarding the future health of your child by providing your baby with a lifetime of insurance needed to take advantage of today's medical breakthroughs and tomorrow's discoveries. (Web Advertising—CryoBank Inc.)

CB Banking is widely promoted to parents as a new form of corporeal insurance, an indemnity against some as yet unknown potential future loss, driven by the expectation of therapeutic potential but also the uncertainties of future disease and kinship responsibilities. There is an emerging moral space developing here where failure to invest now may result in moral recrimination later. As both the respondents immediately below comment, there is great scope here for future regret:

> . . . thinking well you just don't know what's round the corner and that if at any point it was of any use to any of us, and obviously with medical research developing all the time it's, it's something that I'd kind of kick myself . . . . (Female CB parent—CDP1, March 2005)
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> . . . we're not sort of closed to the idea of you know future innovation and so on but it seems to me that at the present, knowing what we do at the present time you can't really, you can't promise much, it's sort of an insurance policy and it's sort of saying basically give us £800 and you can sleep easy in your bed knowing that you've done everything you could possibly have been asked to do. (Interview with the director of a public cord blood bank—March 2005)

Although, in another play on the language of future odds, the promotional language of insurance sometimes slips into the slightly more pejorative language of betting and gambling:

> But we're having difficulty in coming to a decision together because you know for me it feels incredibly speculative and it feels that you know the kind of odds

> involved of us requiring to use it seem to be incredibly high you know and I'd never go to the bookies and put £1500 on a horse at the kind of odds that are the likelihood of us needing to use the, you know anything we bank. (Male CB parent—CDP1, March 2005)

The comparison with insurance also highlights important differences in the indemnity logics of both commercial and public CB banking. Public banking is premised on the mutuality of a shared public resource in which investment is made for the 'general good' in order to broadly share and distribute future risk. Within these frameworks of 'gift', future benefit is both indirect and pooled. In commercial banking, as we noted above, the benefit is restricted to the depositor and whoever else they choose to be a direct beneficiary. This distinction reflects different motivations and embodies different sets of expectations on the part of those deciding to bank CB.

These connections with insurance as a means of safeguarding against future disease will clearly vary between different national contexts and the degree to which people are accustomed to contrasting health insurance systems. To a certain extent at least, the marketing strategy behind the insurance rhetoric in CB banking relies on the familiarity of potential depositors with voluntary private health insurance. In the US, the parallels between tissue banking and 'actual' insurance are far from metaphorical with a number of banks having been initiated by health insurers. In these cases, the insurance package includes payment for the deposit (processing and storage) as well as a premium to cover the costs of actual treatment should the cord stem cells be needed at a later date.

Cord blood banking is far from being an arbitrary form of insurance but one that is highly privatised rather than mutual. By contrast, the UK is far more steeped in what Salter[29] calls 'welfare citizenship' where insurance has played a largely marginal and discretionary role in healthcare provision. It remains to be seen whether and in what way new forms of insurance—in this case highly corporeal—will translate from one health funding system to that of another? Indeed, whether these market pressures in terms of changing patterns of demand from healthcare 'consumers' and increased privatisation of CB stem cells will put pressure on public sector banking to do more?

Nevertheless, the question of the consumption of healthcare insurance is significant in as much as it meshes with highly reflexive forms of risk awareness, what Kelner and Wellman[30] have described as 'smart medical consumerism' among people actively engaged in the gathering of information about services that lie outside mainstream welfare provision, which brings us to questions of agency and participation in healthcare expectations.

Expectations as Action and Agency

Futures and expectations are, by and large, shared attributes that in some circumstances can become embedded in what we might call 'communities of promise'.[31] Nevertheless, this prompts important analytical questions of us in searching for an understanding of how it is that communities of promise come about, on the basis of whose understanding of the future and according to what representational and practical means? In other words, how is it that people are enrolled into sharing in an anticipation and what happens to agency and authorship as expectations stabilise?

Futures also, by and large, involve an increasing tendency towards a process of 'forgetting' the action and agency once responsible for the production of expectations. Deuten

and Rip[32] nicely show how, in retrospect, successful technologies are turned into heroes of their own making, concealing the contingency and complexity on which the future of a technology once depended. Agency, in the formation of futures, can frequently be seen to fall prey to various forms of reification. Expectations of stem cells, pharmacogenomics and the biotech revolution take on a phantom objectivity, an autonomy in which authorship, instigation and cause become lost.

Yet, future-oriented action and agency becomes analytically problematic for us in any number of respects. First of all, communities of promise are highly complex and multi-authored enterprises. It is rarely ever possible to ascribe responsibility for expectations to one actor rather than another. The interview extracts below are poignant illustrations of the point that different participants in a community of promise 'conspire' or 'collaborate' in the authorship of a future. There are probably important parallels here between communities of promise and writing on 'moral economy',[33] what Cheal writes about as a 'system of transactions which are defined as socially desirable (i.e. moral) because through them social ties are recognised and balanced relations maintained'.[34]

Agency is also complex across time as well as across present communities of promise. There are no 'first causes' but rather a long and complex prefiguring of expectations through events, practices, statements and promises stretching through time. Andy Pickering's remark about 'predisciplining of the imagination'[35] is significant here. Material and social factors are crucial features in the authoring of the imagination.

> I feel a pressure myself ... I'm not feeling pressured by anyone in particular or necessarily by any literature but clearly you know when you read the literature, for example [CB Banking Company], the literature they send out, they talk about very few actual applications that we could use right now. And I'm thinking here's a company that's making money out of it ... they're going to be telling me about everything that this could be used for and they're telling me very little. But what they are doing is they're providing reams of literature about what it might be used for .... So they don't actually voice or [laughs] or express ... of course you'd spend that kind of money to make someone better but it comes from within I think .... (Male CB parent—CDP1 March 2005)
>
> ... it's not us who are making the request [to bank] it's the parents ... this is how we see it ... so it's about making people consider the options ... otherwise ... it's really a matter of getting them interested and reading around it ... we're not in the business of making people feel pressurised or coercing them into this ... and we try not to make the language that we use too emotive ... again because we're treading a fine line .... (Commercial CB Bank Marketing Director 1)

However, the complexity of agency is not sufficient to 'let us off the analytical hook'. Analysing the dynamics of expectations involves careful attention to the documentation and study of how it is that communities of promise conspire together, and how it is that they came to be predisciplined in expectation and hope. How, as Brown *et al.* ask, '... metaphors, agendas, scripts, narratives, expectations and promises function as methods by which actors seek (either consciously or otherwise) to secure a certain kind of future for themselves and the many others who will be essential to a desired future?'[36]

Conclusion

Cord blood banking represents the emergence of a significant techno-moral entry point into an increasingly private linkage between parenting and biomedicine. In this form of deposition and investment are a newly nascent set of 'blood ties', reproductive duties and responsibilities connecting private consumers with biological services. UCB banks occupy a particular moral and socio-technical niche—seeing new commodities, industries, regulatory regimes, consumers and moralities based on parental responsibility, family ties and private property. This largely lies outside formal healthcare systems at the moment, as what is traded is hope, building on established forms of insurance and indemnity against risky futures.

For us, this represents something of a curious and intriguing case study in the analysis of expectations, and one which necessitates certain forms of theorising. In making sense of the promises associated with cord blood, we have been interested in untangling the way expectations are tied into new and emerging forms of *capitalisation and property* relations and the deposition for a fee and the exercise of new healthcare consumer investments. We have also elaborated on the role of *hope and affectivity* in which the status and politics of emotion are at the basis of promissory relations. This is connected to *blood ties* where future pathological risk is increasingly being conceptualised as hereditary and familial. CB banking is a form of *corporeal indemnity* where insurance against risk is no longer simply a monetary matter but literally a corporeal *matter*. Making sense of sectors like this necessarily gives rise to a perspective on agency and authorship in the construction of expectations as highly distributed, dispersed and co-constructed.

At the heart of these networks, and central to the discussion above, are questions of the corporeality of expectations, acts of *embodiment and disembodiment* and the parenting of cord blood for long term cryogenic suspension. Like embryos, cord blood has some form of parallel familial biography removed in time and space from kin. In both temporal and spatial terms cord blood storage, like other forms of biobanking,[37] spans time by projecting the investment of bodily tissues into a future where the potential value of that investment 'might' be redeemed. That future is nested in a highly variegated set of moral narratives about blood and its orderings in which present day promises and prospects are corporeally and materially constituted. There are many more threads to the HSC story told here, including a recent (May 2005) ruling by the UK House of Lords granting the Hashimi family the right to use pre-implantation genetic diagnostics (PGD) to select one of their embryos as a source of cord stem cells for treating their first child, a 'saviour sibling' case as it has been dubbed by the press.

While much remains to be seen in how these futures will develop, what we hope to have conveyed here are just some of the different promissory dynamics that are constitutive of the diffuse public, private and patient (potential/actual) networks through which contemporary HSC-based innovation is being constructed.

Notes and References

1. Royal College of Obstetricians and Gynaecologists, *Umbilical cord blood banking*, Scientific Advisory Committee Opinion Paper 2, October 2001.
2. E. Gluckman, H. E. Broxmeyer & A. D. Auerbach, Hematopoietic reconstitution in a patent with Fanconi's anemia by means of umbilical-cord blood from and HLA-identical sibling, *New England Journal of Medicine*, 321, 1989, pp. 1174–1178.

3. European Group on Ethics in Science and New Technologies, *Ethical aspects of umbilical cord blood banking*. Opinion of the European Group on Ethics in Science and New Technologies to the European Commission, 2004.
4. J. Gunning, A worldwide study of umbilical cord blood banking, annex to Opinion 19 of the European Group on Ethics in Science and New Technologies, *Ethical aspects of umbilical cord blood banking*, 2004.
5. Cells4Life Ltd; Smart Cells International Ltd; Cryocare UK Ltd; Future Health Technologies Ltd; Baby Cells Ltd: Cells Ltd; Cryoclinic UK Ltd; New England Cord Blood Bank; Vita 34.
6. C. Thompson, The biotech mode of reproduction. Paper prepared for the School of American Research Advanced Seminar 'Animation and cessation: anthropological perspectives on changing definitions of life and death in the context of biomedicine', Santa Fe, New Mexico, 2000.
7. S. Franklin, Culturing biology: cell lines for the second millennium, *Health*, 5(3), 2000, pp. 335–354; M. D. V. Good, The medical imaginary and the biotechnical embrace—subjective experiences of clinical scientists and patients, Russell Sage Foundation, Working Paper No. 20, p. 3, 2003.
8. Good, *op. cit.*, Ref. 7; M. D. V. Good, B. J. Good, C. Schaffer & S. E. Lind, American oncology and the discourse on hope, *Culture, Medicine and Psychiatry*, 14, 1990, pp. 59–79.
9. S. Franklin & M. Lock (Eds), *Remaking Life and Death* (Oxford, James Currey, 2003).
10. Thompson, *op. cit.*, Ref. 6.
11. M. Mead, Research with human beings: a model derived from anthropological field practice, *Daedalus*, 98(2), 1969, pp. 361–386; R. M. Titmuss, *The gift relationship: from human blood to social policy* (London, LSE Books, 1971); R. Tutton & O. Corrigan (Eds), *Genetic databases: socio-ethical issues in the collection and use of DNA* (London, Routledge, 2004).
12. H. Busby, Reassessing the 'gift relationship': the meaning and ethics of blood donation for genetic research in the UK, PhD Thesis, University of Nottingham, 2004.
13. French consultative ethics committee (CCNE), http://www.ccne-ethique.fr/english/start.htm (accessed January 2006).
14. Gunning, *op. cit.*, Ref. 4.
15. Good, *op. cit.*, Ref. 7.
16. N. Novas, *Embodying hope, hope embodied: PXE International and the creation of the 'next generation of patient advocacy'*, Paper prepared for the July 2005 meeting of the Expectations Network, York, UK, 2005.
17. N. Brown, Ordering hope, PhD thesis, University of Lancaster, 1998.
18. J. Pixley, Finance organisations, decisions and emotions, *British Journal of Sociology*, 53, 1, 2002, pp. 41–65.
19. B. G. Hanson, Conceptualising contextual emotion. The ground for 'supra-rationality', *Diogenes*, 156, 1991, pp. 33–46; R. Harre (Ed.), *The Social Construction of Emotions* (Oxford, Basil Blackwell, 1986); C. A. Lutz & L. Abu-Lughod (Eds), *The Language and Politics of Emotion* (Cambridge, Cambridge University Press, 1990); J. C. Spurlock & C. A. Magistro, Dreams never to be realised: emotional culture and the phenomenology of emotion, *Journal of Social History*, 28, 1994, pp. 295–310.
20. M. Taussig, Reification and the consciousness of the patient, *Social Science and Medicine*, 14, 1980, pp. 3–13.
21. C. Novas & N. Rose, Genetic risk and the birth of the somatic individual, *Economy and Society* (Special Issue on configurations of risk), 29(4), 2000, pp. 484–513.
22. R. Rapp, Genealogical disease: where hereditary abnormality, biomedical explanation, and family responsibility meet, in: S. Franklin & S. McKinnon (Eds) *Relative Matters: Reconfiguring Kinship Studies*. (Durham, NC, Duke University Press, 2002).
23. K. Finkler, *Experiencing the New Genetics: Family and Kinship on the Medical Frontier* (Philadelphia, PA, University of Pennsylvania Press, 2000).
24. L. Prior, F. Wood, J. Gray, R. Pill & D. Hughes, Making risk visible: the role of images in the assessment of cancer genetic risk, *Health, Risk and Society*, 4, 2002, pp. 241–258.
25. *Ibid.*
26. C. Waldby, Stem cells, tissue cultures and the production of biovalue, *Health*, 6, 2002, pp. 305–323.
27. G. Weiss, *Body Images: Embodiment as Intercorporeality* (London, Routledge, 2000).
28. A. Bharadwaj, *Contentious liminalities: embryonic stem cell research in India and the UK*, BIOS Research Seminar Series, London School of Economics, 2 February 2006.
29. B. Salter, *The New Politics of Medicine* (London, Palgrave, 2004).

30. M. Kelner & B. Wellman, Healthcare and consumer choice: medical and alternative therapies, *Social Science and Medicine*, 45, 1997, pp. 203–212.
31. N. Brown, Hope against hype: accountability in biopasts, presents and futures, *Science Studies*, 16(2), 2003, pp. 3–21.
32. J. Deuten & A. Rip, Narrative infrastructure in product creation processes, *Organization*, 7(1), 2000, pp. 69–93.
33. E. P. Thompson, The moral economy of the English crowd in the eighteenth century, *Past & Present*, 50, 1971, pp. 76–136.
34. D. Cheal, *The Gift Economy* (London, Routledge, 1998).
35. A. Pickering, *The Mangle of Practice: Time, Agency and Science* (Chicago, University of Chicago Press, 1995).
36. N. Brown, B. Rappert & A. Webster (Eds), *Contested Futures: A Sociology of Prospective Techno-Science* (Aldershot, Ashgate, 2000).
37. Tutton & Corrigan, *op. cit.*, Ref. 11.