

Chapter 3

Ensure sufficient and appropriate funding is available

EXECUTIVE SUMMARY

The UK bioscience industry faces a near-term funding crisis, as well as medium-term challenges in attracting the funds and exploiting the ideas required to achieve sustainable, profitable critical mass. There are three areas where Government can help the industry meet these challenges.

3.1 Support measures to improve the liquidity of emerging bioscience companies in order to advance self-sustainability.

3.1.1 Support amendment of the Pre-emption Guidelines to permit UK-listed life science companies to issue up to at least 20% of their share capital on a non-pre-emptive basis during a rolling three-year period.

3.1.2 Extend the scope of the current Corporate Venturing Scheme (CVS) to allow investor companies to utilise a tax loss asset received from the investee company in lieu of/in addition to an equity stake. This measure will enable large bioscience companies to monetise their tax loss assets and provide an incentive to engage in partnerships (for example, with pharmaceutical companies) that will improve the chances of successful product commercialisation.

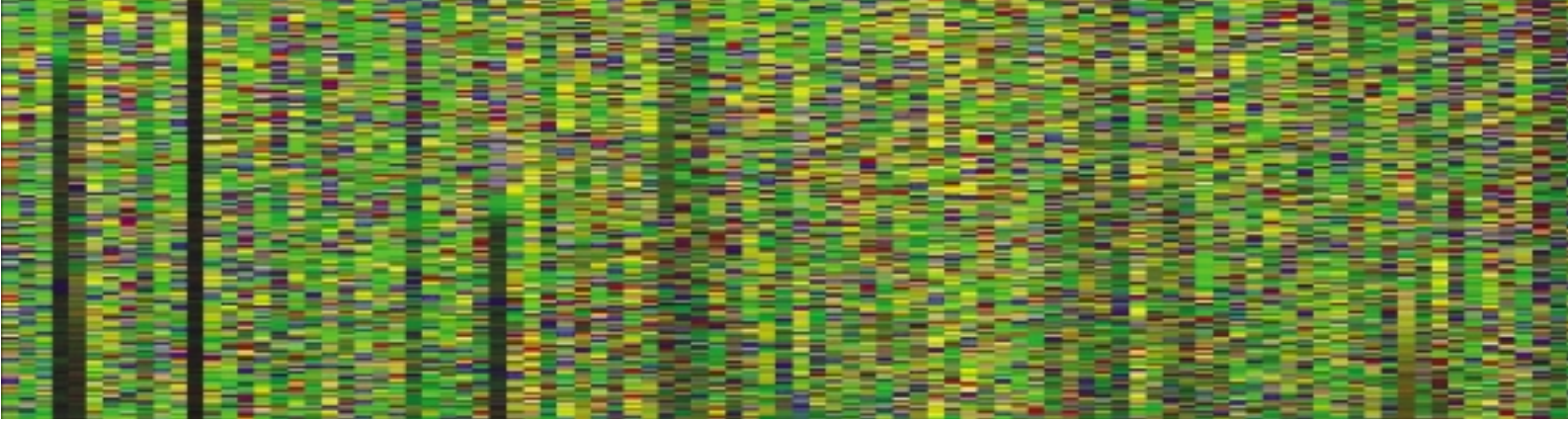
3.1.3 Explore the possibilities for extending the payable R&D tax credit to loss-making bioscience companies with up to 1,000 employees.¹

3.1.4 Ensure that the R&D tax credit applies equally to R&D work contracted out or kept in house, and that innovative manufacturing design work for bioprocessing is covered by the tax credit.

3.1.5 Establish a Bioscience Innovation Awards scheme for 10 later stage human health bioscience companies, providing cash benefit (e.g. through matching R&D tax credits).

3.1.6 Strongly support efforts to create a more accessible and liquid European capital market for technology companies, through harmonisation of listing rules and through an LSE-led, consolidated pan-European technology exchange.

¹ This may be difficult to square with EC state aid rules, but the BIGT believes that the market failure which justifies a more favourable tax credit for SMEs, remains applicable to medium-sized companies up to 1,000 employees, especially where these are still in a loss-making, product-development phase. An alternative might be to allow the more favourable treatment to apply to all 'young', loss-making companies, which are loss-making solely because of long product development periods.



3.2 Invest in the 'bridge' between idea generation and commercial financing, providing the infrastructure and funding to create more high quality, commercially exploitable projects from the academic, research and hospital sectors.

3.2.1 Strengthen Technology Transfer Offices (TTOs) through a series of measures, including a £20 million 'top-up' funding programme to build skills and facilities at leading TTOs; consolidation of existing, small TTO's; new performance metrics emphasising value created rather than number of spin-outs generated; and an 'Entrepreneur-in-Residence' scheme to increase commercial input to promising TTO projects at an early stage.

3.2.2 Ensure the new Higher Education Innovation Fund (HEIF) and the Public Sector Research Exploitation (PSRE) Fund provide adequate funding to accommodate:

- **Technology validation programmes** to provide 'proof-of-concept' funding.
- **Seed funding** to enable supported projects and companies to create the technology and commercial case required for qualifying as 'investment ready vehicles'.

Funds for these purposes should be increased to £280 million per year at the earliest opportunity.

3.3 Improve UK bioscience companies' access to EU funding sources.

3.3.1 Establish a 'Bioscience Framework Access Office' (BFAO) to:

- Improve UK bioscience companies' access to EU Framework sources of funding (e.g. FP6).
- Actively aid Government to shape specifications and access criteria for EU Framework 7 (FP7) funding to maximise opportunities for UK bioscience companies.
- Extend the role of the BFAO over time to become a single point of contact to facilitate access for bioscience companies seeking public funding from the variety of schemes and funding sources available.

3.3.2 Support the EC Biotech Finance Forum's recommendations on creating a 'fund-of-funds' to support European bioscience companies, and lobby the EC to make money available for such a fund.

FUNDING

Why bioscience companies need substantial funding

Building a successful, sustainably profitable bioscience company requires significant funds from third party investors. The creation of profitable, top tier US bioscience companies has historically required an average of ~\$600-700 million prior to profitability. Companies need these funds to finance lengthy, expensive, and risky drug development. As mentioned in *Chapter 1*, taking a drug candidate from the research lab to product launch can take 10 to 15 years. Drug candidates entering clinical trials have only a 10% chance of ever reaching the market. Even in the US, the best-funded bioscience market in the world, bioscience companies have historically taken 10 years on average to reach profitability.



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Scanning electron micrograph of normal bone. This sample is from the 4th lumbar vertebra of a healthy male. The field of view is 12.7mm wide.

These time-lines are unlikely to get any shorter. US companies were well capitalised. Founded on new technology not available to the pharmaceutical industry at the time, they built broad early stage development pipelines which enabled them to produce recombinant versions of known substances such as insulin (Genentech), human growth hormone, and erythropoietin (Amgen). These companies were generally introduced on the public markets when investor sentiment was far more risk hungry and growth focused than is currently the case. In the UK, Celltech went from formation to IPO in 13 years, and to profitability (adjusting for amortisation) in just under six more years.

Funding requirements change over time

The third party funding needs of an 'average' bioscience company evolve over the lifecycle of the company, and the level of funding required increases dramatically over time. Entry of products into clinical trials sparks a substantial increase in funding requirements. For the sake of simplicity, consider three major funding stages (*Figure 3.1*):

- Stage 1: Idea development and validation
- Stage 2: Early stage companies
- Stage 3: Late stage companies

Sources of funding change over time, and require the 'idea generator' to be aware of, and to access, a wide range of individuals and institutions.

Figure 3.1 Illustrative funding cycle

Stage of company evolution	Key activities	Level of funding	Example sources of funding
1. Idea development and validation Idea generation Seed funding	<ul style="list-style-type: none"> Secure assignment from university of IP, etc. Technology validation Develop commercial prototype products Early pre-clinical trials 	<ul style="list-style-type: none"> £50,000 – £1million 	<ul style="list-style-type: none"> University Challenge Seed Funds: up to £250,000 Family/friend/angel funding (e.g. Cambridge Angels): typically £100,000 VCs (seed specialists e.g. Avalor, Sitka and some broader biotech specialist funds e.g. Merlin, Apax, Advent) BBSRC Small Business Research Initiative: grants of £100,000 – 200,000 over 2-3 years, second call of £1.4 m Investment funds aligned alongside research funding bodies <ul style="list-style-type: none"> Catalyst Biomedica (Wellcome Trust) Cancer Research Technology Ltd (CRC) MVM (MRC)
2. Early stage Start-up/first round VC	<ul style="list-style-type: none"> Start developing technology platform/product pipeline Broaden IP base Hire a management team and scientific group Start to engage in corporate partnering Secure premises and build company infrastructure 	<ul style="list-style-type: none"> £1 – 10million 	<ul style="list-style-type: none"> Start-up focused and broader VCs e.g. Abingworth, Schroder Ventures, Apax, Merlin, Advent Very high net worth angels SMART: grants from £250,000 – 400,000, out of total funds of £2 million LINK programme: collaboration between industry and research base, funding 50% of R&D costs over 2-3 year projects, >£100,000
2. Late stage Expansion stage Public companies	<ul style="list-style-type: none"> Build scale, roll out technology platform, continue with clinical development (even launch), and prepare for exit (likely IPO) Continue with expansion stage activities, with ultimate aim of cashflow breakeven/profitability 	<ul style="list-style-type: none"> Multiple rounds of VC funding £10 – 50 million per round Large and variable 	<ul style="list-style-type: none"> Large international VC funds Institutions willing to invest in private companies Pharma/biotech partners Debt Public markets: AIM, LSE, NASDAQ Pharma/biotech partners Debt

The near-term funding crisis

As in the US, the UK sector is facing an immediate and severe funding crisis. The Biotech Finance Forum of the EC estimates a €1 billion funding shortfall among European bioscience companies, of which 50-70% lies in the UK. Over a third of publicly quoted UK bioscience companies have less than two years of cash remaining, and it is difficult to see how some of them will raise the money they require to continue. In addition, the Initial Public Offering (IPO) market is closed: from peak levels of IPOs in 2000, the sector has had no IPOs in Europe in 2003 to date (*Figure 3.2*); and the aggregate valuation of UK public bioscience companies is down 58% from their high in June 2001 (having been as low as 68% in February 2003)².

As a result of the retrenchment in the private equity market and the closure of the public capital markets to new issues, nearly 20% of European bioscience companies started in 2000 have gone out of business.

The medium to long-term challenge for the sector is to provide enough funding to create a critical mass of self-sustaining, profitable companies, with significant ownership of products launched in major markets. The UK starts at a disadvantage relative to the US, which boasts a more attractive funding environment. Funding rounds in the US are significantly larger³ and more frequent, and NASDAQ provides a single public exchange for bioscience companies in contrast to the fragmentation of Europe.

2 Composite index of entrepreneurial bioscience companies drawn from FTSE All Share, including biotech, vaccine, diagnostic and medical equipment companies. Source: share price data Datastream. Excludes large caps such as GSK, AZ, Smith & Nephew, and Amersham. www.datastream.com

3 BioCentury 5 year averages (1998-2002) show the following differences in average funding round sizes: VC funding of \$15 million in US vs. \$11million in UK (36% greater in US); average IPO size \$80million in US vs \$31 million in UK (158% greater in USA); public follow-on funding \$126 million in US vs \$52million in UK (142% greater in US). www.biocentury.com

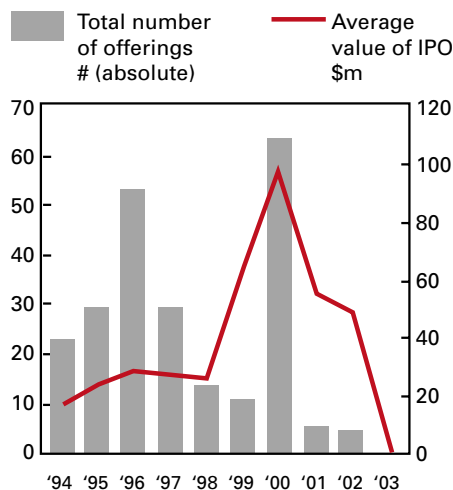
The Government has identified two key areas of market failure in the supply of small amounts of venture capital. First, there is a gap for small businesses raising early stage funding of less than £500,000. This perceived market failure is not specific to the bioscience industry. The Regional Venture Capital Funds (RVCFs) have been launched across the country in response to this perceived market failure. So far there has been little evidence of widespread investment in bioscience companies from these sources, perhaps because the amounts available from these funds are typically too small to be of interest.

In addition, there is a second stage funding gap in the £1-5 million range, which is more typically experienced in the bioscience sector.

This is an immature sector, ripe for consolidation. However, it is vital not to waste the investment already placed in companies. Some are poised not simply to survive but to thrive, and can shape a successful UK bioscience sector.

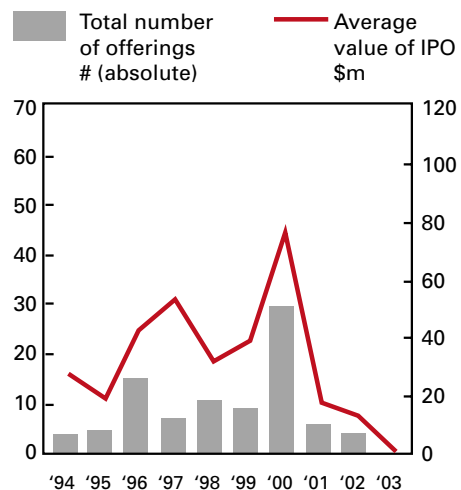
Figure 3.2 Value and number of biotech IPOs

US, 1994-2003*



* Year to 13/5/03

Europe, 1994-2003*



Source: Biocentury Financial Center, Money Flows

Most of the responsibility for survival sits with the sector itself. Companies will continue to struggle to get follow-on funding from venture and trade investors without consolidating. Consolidation between companies with compatible treatments or technologies is required. The grim outlook in the public markets is partly due to the wider downturn in the capital markets – a cyclical downturn that the sector has experienced before. But it is also due to the loss of confidence of generalist institutional investors, who have yet to make money in this technically challenging, long lead-time sector, and are beginning to wonder whether they ever will. The best remedy for this loss of confidence is for the sector to deliver against its promises.

Government, however, has a significant role to play – as outlined in the rest of this chapter.

ACTION REQUIRED

There are three specific areas where Government can particularly help the bioscience industry resolve its current crisis:

3.1 Support measures to improve the liquidity of emerging bioscience companies in order to advance self-sustainability.

3.2 Invest in the 'bridge' between idea generation and commercial financing, providing the infrastructure and funding to create more high quality, commercially exploitable projects from the academic, research and hospital sectors.

3.3 Improve UK bioscience companies' access to EU funding sources.

3.1 Support measures to improve the liquidity of emerging bioscience companies in order to advance self-sustainability.

The success of the UK bioscience industry, in the near and medium-term, depends on a handful of companies achieving sustainable profitability and thus providing successful 'beacons' to both the investor community and the industry itself. Many of these companies face a near-term funding crisis due to the present closure of the public markets. They also face the challenge of financing 10-15 years of costly R&D to deliver their innovations to market. Government can support these companies by enabling them to access alternative sources of funding, so they can turn their own assets (tax losses, R&D investment) into cash-equivalents; or for public companies, by improving access to private and public capital.

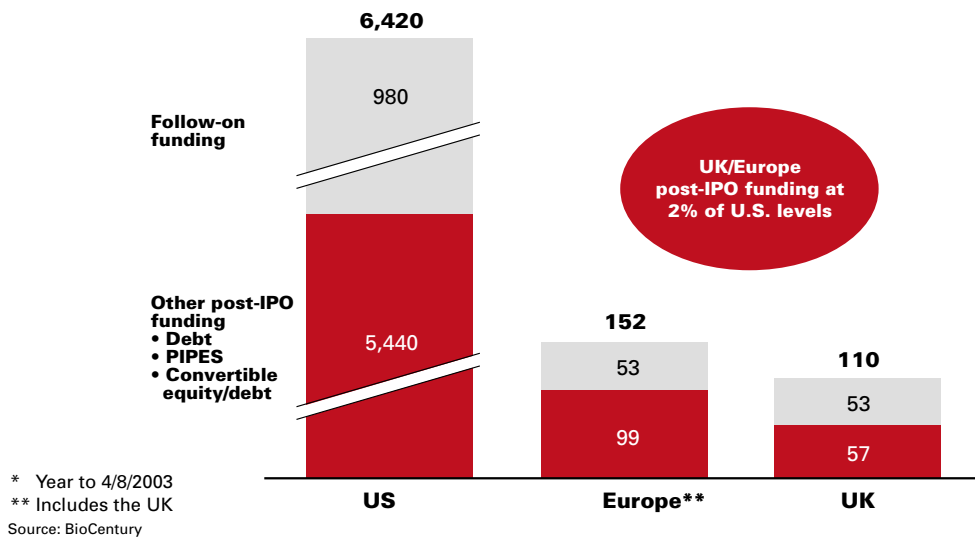
3.1.1 Support amendment of the Pre-emption Guidelines to permit UK-listed life science companies to issue up to at least 20% of their share capital on a non-pre-emptive basis during a rolling three-year period.

Current situation: Funding 'windows' of opportunity can open (and close) in a matter of weeks. Within this time, the share price of companies seeking finance can be severely disrupted by hedge fund operators. If UK companies issue more than an additional 5% of their equity, they are bound by the guidelines of institutional investor groups to offer the stock to existing shareholders first before being able to go to new investors. This process takes time and reduces the ability of companies to raise capital from new sources, restricting the ability of companies to benefit from the brief windows. The BIA and the London Stock Exchange (LSE) have raised this issue on a number of occasions and are fully supportive of guideline changes.

These restrictions on speed and flexibility put UK bioscience companies at a marked disadvantage to their counterparts in the US, where, for example, companies can rapidly execute secondary offerings or use private investment in public entities (PIPEs) vehicles to access funding more quickly and efficiently. This difference in ability to raise follow on funds is illustrated in *Figure 3.3*. The disadvantage is felt acutely currently, when the public markets are so depressed.

Figure 3.3 Post-IPO Biotech Funding

USD millions, 2003 year-to-date*



This topic is not just a UK issue. As part of attempts to improve European competitiveness vs US, reducing pre-emption rights is part of the agenda of harmonisation of financial markets regulation currently under investigation by the European Union. In May 2003 the European Commission presented an Action Plan on “Modernising Company Law and Enhancing Company Law in the EU”. One of the proposals in this plan includes reducing the pre-emption rights of current shareholders.

The recommendation: The current limits on non pre-emptive equity issues should be made less restrictive for loss-making companies by lifting the current 5% annual limit, and 7.5% limit over three years on issue of new equity, to 20% over each rolling three-year period. This limit should be applicable to companies that have a market capitalisation of less than £1 billion adjusted for inflation from rates as at mid-2003.

The Association of British Insurers (ABI) and other institutional shareholder bodies oppose such

extensions of the limit for dilution reasons. The Government can play an important role in bringing the UK into line with international norms and EU-proposed practice, by supporting the view that this restrictive stance towards pre-emptive issues is harmful to the prospects of the bioscience industry and, by extension, the growth and intellectual capital of UK plc. Specifically, options for change could include the following:

- In the long-term, supporting amendments to the European Second Company Law Directive (and by extension to the UK Companies Act 1985, in particular s94 or s95, which implements the relevant part of the Directive into UK law);
- In the short-term, pressing for review of the Pre-emption Guidelines issued by the Pre-emption Group (ABI, National Association of Pension Funds (NAPF), investment banks and the UK listing authority) and arguing for changes to the UK LSE Listing Rules (Financial Services Authority (FSA)).

3.1.2 Extend the scope of the current Corporate Venturing Scheme (CVS) to allow investor companies to utilise a tax loss asset received from the investee company in lieu of/in addition to an equity stake. This measure will enable large bioscience companies to monetise their tax loss assets and provide an incentive to engage in partnerships (for example, with large pharmaceutical companies) that will improve the chances of successful product commercialisation.

Current situation: For bioscience companies, long product development time lines and substantial R&D expenditure, extending back into pre-company formation, mean that there is a very significant delay before tax loss assets can be offset against profits. From 2000, SMEs can monetise their tax losses but the current tax regulations limit the ability of medium-sized or large companies to do so either through operations or a strategic transaction. Although from 2002 these larger companies can claim super deductions on their R&D investment, these assets are unable to be monetised. These regulations significantly affect later stage bioscience companies, restricting their ability to access cash through their own operations and thus delaying self-sustainability.

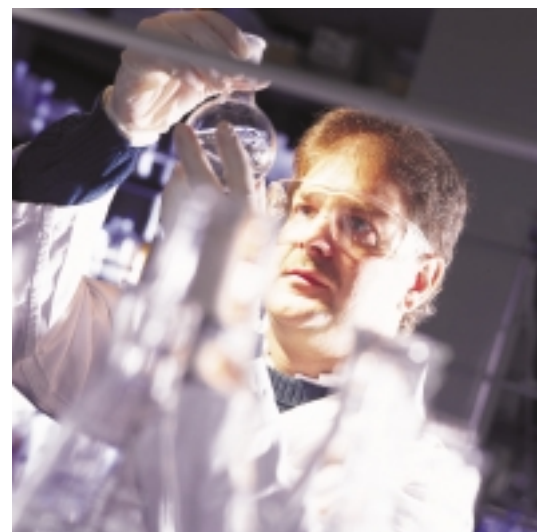
The recommendation: Extend the scope of the current Corporate Venturing Scheme (CVS) to allow investor companies to partially utilise tax loss assets generated by the ventures supported (e.g. joint ventures on product development between pharmaceutical and bioscience companies), by amending the current tax relief available within the CVS.

Specifically, in addition to the investment relief, deferral relief and loss relief, which are currently in place, the BIGT recommends adding the use of accrued company tax losses to the CVS scheme. Investing companies should be able to acquire a percentage of the companies' accumulated tax losses in proportion to the investment made.

Although the political consequences of such tax changes may be difficult, the BIGT believes that limiting it to the parties within the CVS will limit costs. The negative consequences are also out-weighed by the positive prospects for self-sustainability of some of UK plc's leading innovators that change will generate.

3.1.3 Explore the possibilities for extending the payable R&D tax credit to loss-making bioscience companies with up to 1,000 employees.

Current situation: The definition of qualifying small and medium-sized enterprises (SMEs) (i.e. fewer than 250 employees and annual turnover not exceeding €40 million) within the payable R&D tax credit regulations⁴ is currently problematic for bioscience companies who have to operate at a commercial scale for a significant period before generating profits. Many such companies have to expand outside the SME definition some time before they can become profitable. When they do so, they effectively lose the benefit of the R&D tax credit altogether. Therefore, the R&D tax credit regulations should be amended to allow larger loss-making companies to benefit from a tax repayment (as for SMEs) rather than just a tax credit.



The recommendation: Consider extending the qualification from the current threshold of 250 employees to a higher limit of up to 1,000 employees. Initial reaction suggests that raising the employee criteria hurdle for all loss-making companies would make the proposal prohibitively expensive. If this is the case, one option would be to make the extension specific to the bioscience industry, despite a general reluctance to introduce sector specific tax measures, due to the direct and immediate benefit that such a change would have for the UK sector. It is understood, however, that there are likely to be EU state aid obstacles to sector-specific measures of this kind, or to extending the benefits currently available only to SMEs to companies with up to 1000 employees.

If these obstacles prove insuperable, an alternative approach could be to extend the SME benefits to all 'young' loss-making companies of any size, but with a proviso to limit the cost of this approach. The extra benefit would only be available to companies that have never made a profit and are still in a research-based phase of development.

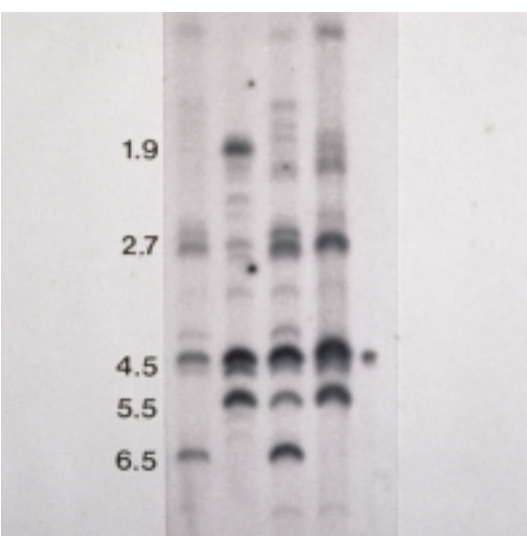
A test for this could be that eligible companies must spend more on R&D than they derive from product sales in a given year, or must be loss-making solely because of the need for substantial investment to validate new product development. The aim would be to avoid discouraging new, technology-based companies from expanding to optimum size, during lengthy periods before their first substantial products can be launched commercially.

The payment system should be structured as an upfront payment with an end of year post-audit adjustment, rather than an upfront payment and rebate system. This would bring forward the funds flow to qualifying companies.

3.1.4 Ensure that the R&D tax credit applies equally to R&D work contracted out or kept in house, and that innovative manufacturing design work for bioprocessing is covered by the tax credit.

Current situation: It is common practice in the bioscience sector for key parts of the R&D process to be contracted out to specialist organisations. Contract Research Organisations (CROs) are often used for management of clinical trials and other specialised research and testing functions. Small-scale manufacturing for clinical trials purposes is also often contracted out to specialist bioprocessors. These specialised research organisations add considerable value to the UK economy and to the UK biotechnology industry in particular.

Under the current regime for the R&D tax credit, SMEs contracting work out to specialist organisations can still count the cost of such work as R&D (if it meets the relevant criteria). Large companies, on the other hand, cannot claim the tax credit for work sub-contracted in this manner. In the latter case (where the work is sub-contracted from an organisation based overseas) the sub-contractor can, in theory, claim the credit but in practice often cannot. The sub-contracted work is often



DNA gene mapping

Wellcome Photo Library

not assessed within its context, and the individual work elements may be deemed not to constitute R&D, even though they would qualify as R&D if carried out by the bioscience/pharmaceutical principal. This raises the cost of sub-contracting out work for the larger bioscience/pharmaceutical companies, discourages investment in the UK by the sub-contractors themselves, and creates perverse incentives not to use specialist sub-contractors, when these might have valuable expertise to offer.

There has also been considerable uncertainty about the extent to which bioprocessing work can qualify for the R&D tax credit more generally. Obviously, the running costs of a full-scale manufacturing operation would not normally be considered as research or development. But much of the investment in bioprocessing relates to manufacturing process design. Because techniques for bioprocessing are new and evolving so fast, each new potential product may require an innovative manufacturing approach.

A large part of the current investment in bioprocessing is also related to production of very small quantities for clinical trials purposes only. In many such cases the process really is the product, and the regulatory authorities are as insistent on verifying the process as on any other aspect of the product. In such cases, it could certainly be argued that the manufacturing of clinical trial quantities constitutes R&D in its own right, as well as being a part of the overall R&D process.

The recommendation: Expenditure on work which qualifies as R&D when performed by a bioscience or pharmaceutical company, must also qualify when performed by a CRO or specialist bioprocessor. Subcontracted work must be assessed as a part of the overall R&D process relating to each research project as a whole, not just assessed as a research project on its own. Bioprocessing work should count as R&D under the tax credit to the extent that it is innovative, and relates to process design and/or production only for clinical trials purposes.

3.1.5. Establish a Bioscience Innovation Awards scheme for later stage human health bioscience companies, providing cash benefit (e.g. through matching R&D tax credits).

Establish a Bioscience Innovation Awards scheme to provide a mechanism for partially addressing two of the major problems facing later stage bioscience companies:

- Near term cash flow,
- Poor investor sentiment on sector ability to deliver.

The awards should be targeted at human health bioscience companies with more than a threshold number of employees (e.g. 125 – half of threshold of SME R&D tax credit) and at least one product in which they have retained substantial ownership in Phase II clinical trials. The awards would look to recognise companies that have passed a significant innovation stage during the past 12 months (e.g. major milestones achieved, products moving to higher clinical trial levels, registration etc).

The awards would seek to offer real cash flow related rewards, commending companies for innovation and excellence that are close to commercialisation through offering matchings to their R&D tax credits, equivalent to:

- 100% for five Tier 1 winners
- 50% for five Tier 2 winners

The presentation of these awards and publicity surrounding them should serve as a highly visible platform for celebrating success and achievement both to industry peers and the investment community.

3.1.6 Strongly support efforts to create a more accessible and liquid European capital market for technology companies, through harmonisation of listing rules and through an LSE-led, consolidated pan-European technology exchange.

Current situation: European bioscience companies are at a marked disadvantage relative to their US counterparts, due to the lack of a single public equity exchange with the critical mass in bioscience of NASDAQ. There are around 22 mainly nationally focused public exchanges in Europe, each of which has no more than a handful of bioscience companies. These exchanges individually lack liquidity and the necessary foundation of specialised analysts and fund managers that would encourage new capital to enter the sector, and help insulate the sector from the failures of individual companies and products.

The recommendation: The bioscience industry strongly supports the concept of providing a single, pan-European high technology exchange, ideally based in London. The development of such a genuinely pan-European exchange, regulated

along London lines, should be actively promoted. Such an exchange would improve the funds flow into the sector, helping the sector to achieve investment critical mass by:

- Providing a focal point for trading, thus improving liquidity;
- Enabling easier transactional investing by specialist funds;
- Encouraging the development of sector-specialist indices and funds;
- Encouraging the development of pan-European funds and analysts.

Given the problems experienced by EASDAQ and the collapse of the Neuer Markt, the 'sponsorship' and regulation of a highly credible global exchange, such as London, is important for building investor confidence and support. London is ideally positioned to operate such an exchange, given the longer established UK sector and the City's position as one of the major global investment hubs. The LSE should be encouraged to lead the consolidation to create a pan-European Technology Exchange based in London.

As a first step while the long-term solution is being worked out, the bioscience industry and the UK Government should promote harmonisation of listing requirements for bioscience/high-tech companies on European stock exchanges, for example, relaxing regulations and guidelines for SMEs concerning the use of PIPEs.

3.2 Invest in the 'bridge' between idea generation and commercial financing, providing the infrastructure and funding to create more high quality, commercially exploitable projects from the academic, research and hospital sectors.

Although our R&D investment still lags behind the US on a per capita

basis⁵, the UK's scientific and medical Research Councils and charities mean that idea generation continues to be comparatively well funded in this country. This is an investment that the UK will need to maintain and increase in order to protect its global position. As indicated by the numbers of patents filed, papers published, and spin-outs generated, the UK is not suffering from lack of ideas.

However, many of the ideas coming forward from universities and Public Sector Research Establishments – including NHS Trusts – for commercial funding are at too early a stage of development, and have insufficient commercial focus to be fully exploitable. The challenge is to increase the quality of ideas that advance to the commercial threshold by increasing the amount and quality of work done on them.

Particular areas of current weakness are the applied research involving technology validation, and the building of commercial propositions with a clear business model and strong talent. Both are essential to attracting private capital. UK research bodies do not provide significant funding for the former. The latter has become even more important as capital market declines have reduced the exit potential for commercial investors, causing them to 'raise the bar' on what they will invest in. Even as capital markets recover, it is unlikely that investor risk appetite will return to the exuberant levels of the late 1990s. A robust technical and commercial proposition, managed by experienced, credible people, will be a prerequisite in order to attract new investors.

A fundamental re-think is required about the support provided to idea generators, in order to better create

winning ideas, from the development stage to 'investment ready vehicles', which are attractive to private sector capital. An integrated 'bridge' of several reinforcing measures is required.

The Government's Higher Education and Innovation Fund (HEIF – incorporating the University Challenge Fund) and the Public Sector Research Exploitation (PSRE) Fund, are examples of Government help in this arena. The HEIF (£187 million over 2004-5 and 2005-6) can be used to provide funding to enable Higher Education Institutions (HEIs) to establish and maintain Technology Transfer Offices (TTOs) to respond to the needs of business – through continuing development of capacity in universities to interact with business, and large, strategic, collaborative projects to strengthen university-business partnerships. The HEIF will provide pump-priming resources for technology transfer, entrepreneurship training, corporate spin-outs, and knowledge transfer from HEIs into business and the community.

Similarly, the PSRE Fund⁶ (£15 million over 2004-5 and 2005-6) enables public sector organisations that carry out research – including Research Council Institutes (Centres, Surveys and Units) and NHS Trusts – to develop their capacity to exploit science and technology potential and to access seed funding to support the commercialisation of research.

The BIGT proposals are designed to build on the work carried out so far, by focusing on key issues to be addressed.

The main component of this bridge (*Fig. 3.4*) will be a significantly strengthened and consolidated local support infrastructure. This will

⁵ US: \$105 per capita, UK \$95 per capita. Source: OECD www.oecd.org and DRI-WEFA www.dri-wefa.com

⁶ PSRE Fund was a response to the Baker Report (August 1999) on realising the economic potential of public sector research establishments. First round awards worth £10m were made in October 2001. In addition, the PSRE fund has provided seed funding to support the very early stages of business formation about ideas emerging out of research in the public sector science base. (PSRE Basic Guidelines). www.ost.gov.uk/enterprise/knowledge

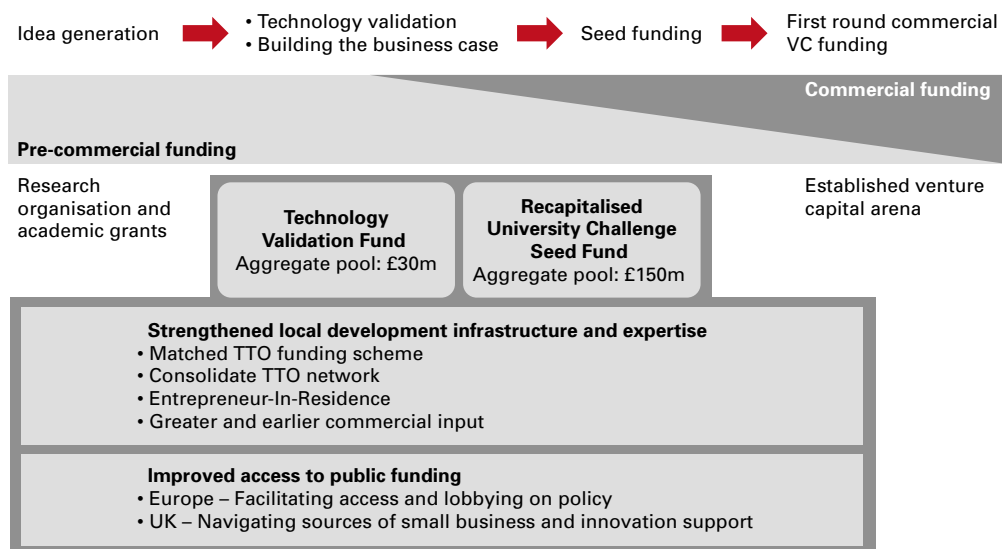
provide improved ways of working, a higher level of front-line support to projects, and a source of direct funding support, focused on developing the technical validation and commercial application of a project. Much of this strengthened support will aim to build on the best of existing structures. These measures are designed to bring more projects of sufficiently high quality to the commercial threshold to attract investors.

Such programmes require significant investment to be successful:

- The various components of the TTO strengthening programme are estimated to require £20 million annual funding over a three-year period. (3.2.1).
- The funding elements of the new HEIF and the PSRE Fund should be structured to provide priority funding for technology validation programmes and seed funding activities. (3.2.2).

The recommendations below will be of benefit to all high technology sectors, not just bioscience, that are currently seeing research spun-out into start-up companies.

Figure 3.4 Components of 'bridge'



3.2.1 Strengthen Technology Transfer Offices (TTOs) through a series of measures, including £20 million 'top-up' funding programme to build skills and facilities at leading TTOs; consolidation of existing, smaller TTO's; new performance metrics emphasising value created rather than number of spin-outs generated; and an 'Entrepreneur-In-Residence' scheme to increase commercial input to promising TTO projects at an early stage.

Current situation: The UK has made significant headway in the past 10 years creating infrastructure and funding to commercialise university-generated intellectual property through the creation of TTOs. But the focus has historically

been on 'volume' – of ideas generated or spinouts created – rather than on 'quality' or maximizing commercialisation potential. For example, the US is more inclined to grant technology licences than the UK. The ratio of technology licences granted by universities to university-originated spin-outs in the US is 10:1; in the UK it is 1.5:1.⁷ The major challenge at this stage is to improve the quality of ideas that advance to the commercial threshold and, where appropriate, concentrate these ideas into sustainable vehicles.

The best of these TTOs are world-class. However, many are sub-critical or have too low a deal flow to build sustainable competence. Additionally, HEIs tend to under-invest in their TTOs as returns flowing back to HEI bear little relation to that of the economy as a whole. The resource and expertise levels in these offices need to be strengthened.

The recommendation: There are four components to strengthening the TTOs: 'top-up' funding; consolidation; new performance metrics emphasising value created rather than number of spin-outs generated; and increased, earlier interaction with commercial investors. Measures to strengthen the TTOs are estimated to require £20 million annual funding.

1. *'Top-up' funding:* The Government should top-up funding by selected high activity HEIs. This additional funding would be targeted at increasing the experience of technology transfer managers at each HEI and research organisation, crucially through providing competitive salaries and benefits to attract the best people and resources.
2. *Consolidation:* TTOs at smaller HEIs should partner with larger TTOs within the same region, or merge with other local HEIs to form 'regional hubs' concentrating resources and expertise and increasing project critical mass. Partnership between larger and smaller TTOs could be facilitated by additional financial incentives for the larger centre to 'mentor' and support the smaller centre, or by enabling experienced HEIs in a region to manage a local network of satellite offices.
3. *New performance metrics:* The BIGT believes the new performance metrics for TTOs being developed by the OST should be based on the quality of ideas and their economic impact, rather than the proliferation of ideas and spin-outs themselves (which current HEI assessment metrics encourage). Indeed, licensing to existing companies can often be the best method of commercialisation.
4. *Increased, earlier interaction with commercial investors:* TTOs should be encouraged to form local networks, perhaps around key TTO hubs, where TTOs, commercial investors and academics could meet. Such meetings would provide the opportunity to identify the priorities and constraints of various interest groups. The commercial investors could be encouraged to become involved by gaining privileged access to early opportunities, in exchange for providing commercial advice and expertise to TTO-supported companies. It could also be a condition of certain types of funding and support that venture capital investors, and potentially individuals from industry, form part of governance structures.

3.2.1 In addition: To create and fund an 'Entrepreneur-In-Residence' scheme to increase commercial input to promising TTO projects at an early stage.

To further strengthen the TTO programme, at least eight high activity TTOs should have a revolving position of 'Entrepreneur-In-Residence' (EIR) at each location. These individuals should be credible, proven entrepreneurs who are available to support the project development and business proposal planning of ideas generators.

These EIRs would be well placed to head spin-outs as they arise, given their good understanding of projects from early involvement, and their more experienced view of commercialisation issues, including funding requirements and managing relationships with funders. Equally, however, the intention is to provide the EIRs with a base and financial security, so that they are not compelled to leave to head the first spin-out that emerges and can stay and mentor further projects.

These EIRs should be supported by additional central funds, above the TTOs existing funding requirements, reflecting the significant cost (estimated £150,000 per post per annum) of attracting the required level of talent, potentially from abroad.

It is anticipated that the level of activity in eight current TTOs', and perhaps in some of the consolidated TTOs of the future, will be sufficient to support an EIR programme. This implies a programme cost of at least £1.2 million per annum. The EIRs should be able to access and mentor opportunities from a local area or 'network' of TTOs.

3.2.2 Ensure the new Higher Education Innovation Fund (HEIF) and the Public Sector Research Exploitation (PSRE) Fund provide adequate funding to accommodate:

- **Technology validation programmes** to provide 'proof of concept' funding to promising ideas.
- **Seed funding** to enable supported projects and companies to create the technology and commercial case required for qualifying as 'investment ready vehicles'.

Current situation: The UCSF has been very well received by industry. The BIGT would like government to grow and nurture this excellent initiative. Bioscience start-ups need capital early on for developing commercial prototype products, starting significant pre-clinical trials, hiring a management team, and starting to build company infrastructure (e.g. securing premises). The seed funding stage remains, however, only a quasi-commercial stage. Risk of failure is high, and with a closed IPO market and a more risk averse stance likely to persist even as markets improve, the risk/reward trade-off is often unattractive to a commercial investor.

Helping university-generated ideas bridge this gap was the original idea behind the University Challenge Seed Fund. The current UCSF is over and no more funds will be made available through it. The UCSF, Science Enterprise Challenge Scheme and HEIF are to be incorporated into an expanded HEIF. The BIGT believes that the seed funding and technology validation activities of this funding stream should be revamped and made funding priorities.

The current UCSF framework has also been insufficient to support adequately projects generated out of academic research.

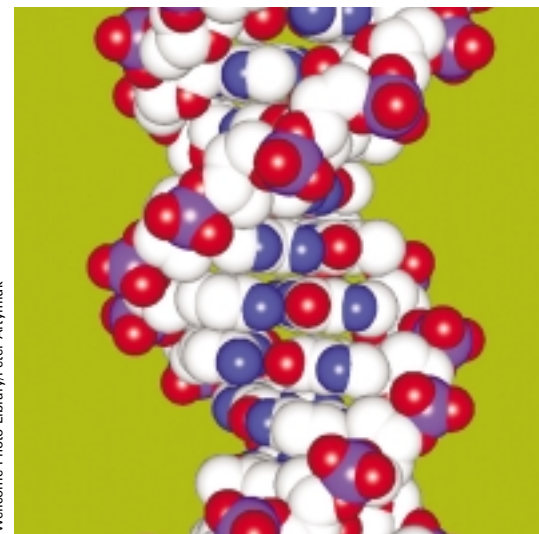
- The overall 'pot' of £60 million was too low and has now been exhausted. Key centres of activity, such as Cambridge and Imperial College, each had only £4 million to commit.
- Requirements for local funds to be self-financing over a four-year period were unrealistic given the lengthy time-line to product launch (typically 10-12 years), and the inherent high risk involved in projects at this stage of development.
- The £250,000 individual investment cap has proved to be too low.
- The restriction on making follow-on investments has reduced the ability of funds to protect their investments.

The recommendation: The new expanded HEIF should be created in such a way as to provide adequate funds for technology validation and seed funds. If the £187 million currently allocated to HEIF for 2004-05 and 2005-06 does not meet the increased demand for these elements, especially given the proposed ceiling of £2.4 million per HEI, the BIGT believes steps should be taken to ensure 'top-up' through additional funding. The BIGT believes that funds just for technology validation and seed funding for research organisations and companies should be increased at the earliest opportunity to £280 million over two years.

a) ***Technology validation programmes to provide 'proof-of-concept' funding***

Technology validation is a clear and specific gap in current funding support and is aimed at helping potential companies, before they are in a position to access seed funds or attract investors. Its pre-commercial development timing makes it unattractive for seed-type investment. Public funding is either more research focused and/or in too small packages to meet the needs of bioscience technology validation. A focused technology validation fund would support this gap, and also serve as another commercialisation filter, leading to fewer but more commercially attractive projects being spun out. Local technology validation funds could fund validation of both commercially exploitable and demonstration projects as they emerge from any source (HEIs, NHS, entrepreneur networks, etc.).

The funds for the validation programmes would take the form of grants, given the high-risk nature of investment at this stage, and reduce the administrative distraction to idea generators. Grants should be about £100,000-150,000 per project.



View of a short piece of a DNA double helix.

Wellcome Photo Library/Peter Artymiuk

b) **Seed funding** to enable supported projects and companies to create the technology and commercial case required for 'investment ready vehicles'.

The funding should be focused to provide a risk and reward profile attractive to commercial funders. Capital should be allocated to centres of excellence through a competitive bidding process, along similar lines to the first round UCSF.

Given the high-risk profile of projects at this early stage of the development cycle, and considering the length of time to product launch, allocations should be structured as grants. The funds should not be expected to be self-sustaining. Individual project caps could be raised to £1 million on a staged basis. Given the diverse nature and circumstances of these projects, there should be no restrictions on making follow-on investments.

The local seed funds should seek to give grants to a more focused selection of projects than the TTO and others in the region support. A combined committee of venture capitalists, technology transfer managers and industry representatives should make the grant decisions. Criteria for selection, given validated technology, will centre on the potential for commercialisation and the attractiveness to commercial investors later on.

Commitments will be provided on a staged basis, with milestones relating to both product progress and commercialisation potential. It should be noted, that while the cap is raised to £1 million, it will not be available as a first round single payment. In addition to funding, an expert support package will be provided. This will include advice on commercialisation and organisation structure, and involve private sector input.

The combination of the technology validation programme and a revamped seed funding system should lead to fewer but higher quality investment candidates. These 'filters' should provide the means for several validated and commercially attractive technologies to be rolled into one more viable investment vehicle.

3.3 Improve UK bioscience companies' access to EU funding sources.

Substantial funds are also available to UK bioscience companies from European sources. The Framework Programme (FP) – the EU's main instrument for supporting strategic European research – is the most significant pool of European funds available to UK bioscience companies and research organisations. The current Framework 6 (FP6) programme provides a total of €17.5 billion over three years covering all research areas. A total of €2.3 billion of those funds is earmarked for health and bioscience. Academic institutions or companies of any size can apply. According to the FP6 target, 15% of the fund is focused on SMEs.

Historically, the UK has proved successful accessing framework funding. The UK won 22% of the FP5 applications under the 'Quality of Life' theme, which includes bioscience for health applications. This success rate was only exceeded by Sweden. However, the main beneficiaries are UK universities rather than companies. Across Europe, only 9% of FP5 funds went to industry, most of the funds went to HEIs and research institutes.

There are basic barriers for industry in applying for these funds. The application process is long, bureaucratic, difficult to understand, and consumes too many resources for too little return – for SMEs in particular. The average grant sizes is ~€1million. Furthermore, the awards call for substantial international collaboration, which makes them impractical for most SMEs. Crucially, decisions on grants in general, and the Framework Programmes in particular, can take up to 18 months. This is far too long given the short lifecycle of bioscience company funding.

3.3.1 Establish a 'Bioscience Framework Access Office' (BFAO) to:

- Improve UK bioscience companies' access to EU Framework sources of funding (e.g. FP6).
- Actively aid Government to shape specifications and access criteria for EU Framework 7 (FP7) funding to maximise opportunities for UK bioscience companies.
- Extend the role of the BFAO to become a single point of contact to facilitate access for bioscience companies seeking public funding from the variety of schemes and funding sources available.

Current Situation: Some of these issues are already being addressed and aimed at improving existing support services. There are proposals to fund a Central Information Point (CIP) and a more integrated National Contact Point (NCP) support service with pro-active specialists, in contact with NCPs across thematic priorities of key interest to the DTI/OST (Genomics/Biotechnology, Information Society Technologies and Nanotechnologies). These services will be delivered by external contractors under the joint management of the OST and DTI, with the aim that at least 15% of the FP6 funds will be allocated to UK organisations.

The CIP and NCP support office will play a role in increasing awareness of FP6, and supporting early preparation of documents. They will also help tracking the destination of framework funding.

However, the offices do not appear to address all the needs of SMEs. They will play only a limited role in origination and support of the administrative process. The BIGT believes there is a need for increased monitoring of progress of applications through Brussels and greater follow-on help for SMEs.

The value of FP6 funding to SMEs is critically determined by an understanding of the likelihood of success, and the timing of dispersion of funds. Indeed, one SME found that working with the current sub-contracted group had limited impact on either the submission or its chances of success. The latter issue really needs to be addressed. Steps must be taken to ensure that the new NCP support system and CIP increase transparency of the factors affecting success within FP funding, and increase the chances of obtaining FP funding for proposals.

The recommendation: A Bioscience Framework Access Office (BFAO) should be established within the new NCP support service. The BFAO should consist of a small number of dedicated bioscience individuals, and would act as a catalyst for applications. The BFAO could help companies and idea generators navigate the complex networks of public funding sources and administrative

processes. The BFAO could also act as the facilitator for bringing together and coordinating the various stakeholders (industrial, academic, etc.) involved in proposals. The BFAO should also help with the origination of proposals, and develop and forward policy in collaboration with the NCP for future Framework Programmes. In the longer term, the BFAO should extend its role to become a single point of contact to facilitate access for bioscience companies seeking public funding to the variety of schemes and funding sources available.

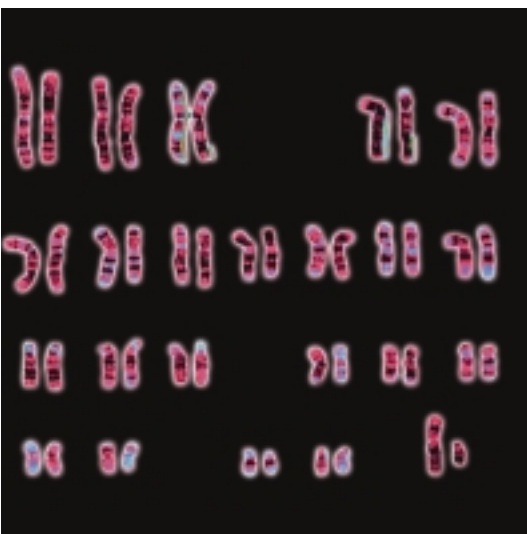
The BFAO should initially consist of four or five people, who will act as a secretariat to help bioscience companies complete and pursue successful applications. This could include a full-time member of staff operating from Brussels, possibly located in the UK Research Organisation. Required funding support is estimated to be £500,000 per year. The BFAO will also actively promote this source of funding to the industry, and will seek to connect different institutions, including RDAs that could join forces on similar projects.

The BFAO's 'big ticket' policy work should be a key focus of its efforts, and shouldn't be overwhelmed by efforts to support individual applications. Thus the BFAO should prioritise the top 100 submissions (dependent upon the number of staff), become the 'champion' of all aspects of these proposals until full submission, and provide follow-on assistance until funding is agreed.

The impact of the BFAO would be monitored against performance objectives, which could include:

- Timing from submission to receipt of funding;
- Detailed tracking of bioscience SME-related submission and success;
- Number of new jobs created from Framework funding.

The above measures should be adjusted in the light of experience and changes proposed below to FP7 to ensure even greater access by UK bioscience companies.



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Normal male human chromosomes showing X (large) and Y (small) chromosomes in the bottom right hand corner.

The BFAO will also seek to help the UK Government shape specifications and access criteria for subsequent EU Framework Programmes, liaising with the NCP. The BFAO will provide detailed input from bioscience SMEs to the NCP as the EC consultation on FP7 begins in 2004. This provides an opportunity to seek to remove barriers that have historically made these funds difficult to access for UK bioscience companies. The UK should recommend:

- Increase the threshold of funds targeted at the broader definition of SMEs from 15% to 30% (as a minimum). This could be delivered by ensuring greater availability of funding under the SME-specific measures, e.g. CRAFT (co-operative research) and Collective. This initiative would increase opportunities for SMEs to participate in Specific Targeted Research Projects (STREPS).
- Increase average funding award to €3-5 million.

- Simplify the application process to reduce the administrative burden on companies and academic institutions, e.g. by making application materials available electronically, as is the case in other work theme areas.
- Shorten the decision-making process and, therefore, the lead times to receipt of funds. Increase transparency within the decision-making progress.
- While the BIGT appreciates that the Framework Programme is a pan-European collaborative R&D programme, the current requirement with regard to the 'number and nature' of partners is difficult to meet for commercial organisations which typically lack focused governance structures and need shorter funding time-lines. (For example, the FP6 'co-operative research instrument' for accessing funding requires a consortium of at least three SMEs from at least two different countries). The possibility of relaxing these requirements for SMEs should be investigated.

In the longer term the BIGT believes aspirational targets for framework could include:

- UK organisations to lead at least 20% of projects;
- UK organisations to be involved in 30% of FP6 projects (current involvement in bioscience themed projects is approximately 15%);
- At least 50% of the UK share to be won by businesses and non-academic organisations;

3.3.2 Support the EC Biotech Finance Forum's recommendations on creating a 'fund-of-funds' to support European bioscience companies and lobby the EC to make money available for such a fund.

Current situation: The Biotech Finance Forum (BFF) of the European Commission has reviewed long-term global industry trends and future capital supply and demand, and unanimously concluded that the sector in Europe is facing a potentially serious short to medium-term funding gap. The BFF working group estimates there could be a potential shortfall of up to €1.0 billion in funding in 2003 alone (as estimated in 2002). There are also structural problems resulting from the recent creation of a large number of companies with technologies of limited commercial utility and inexperienced management.

The BFF recommended that the European Investment Fund should expand its existing role as a 'fund-of-funds' and provide €500 million (€250 million from the EIF and €250 million from the EC) in matching funds to VCs and institutional investors, to combat an estimated €1 billion funding gap in 2003. This seems to have lost some momentum in recent months and will require political support at a senior level to influence both the EC and the European Investment Bank to allocate funds to the EIF for this purpose.

The recommendation: The UK Government should support the BFF recommendations, pending clarification and changes of position as the situation evolves. However, Government needs to ensure that the amounts available are sufficient and may need to lobby for increased funds and put a limit on the number of eligible companies. The mechanism for allocation needs to ensure that the VC provides the commercial test.

The UK Government should support the principal of EC funding of fewer but better-qualified companies.