EDISON

Oxford BioMedica

Corporate outlook

Balancing risk to optimise reward

Pharma & biotech

Oxford BioMedica (OXB) is a leader in lentivirus based gene technology and ongoing manufacturing deals (CTL019 with Novartis) underpin the valuation. We expect pipeline focus in the near term as OXB aims to optimise development via out-licensing or externally funded SPVs. The newly announced strategy takes into account the balance of risk versus reward for stakeholders (against the backdrop of the significant financial resources required over the next two to three years to advance OXB's value, driving assets to the next stage). The recent net £10m equity fund-raising will extend the current cash runway beyond 2017 due to reduced R&D expenditure; further funding and value may arise from additional manufacturing or IP licensing deals. We value OXB at £173m.

Year end	Revenue (£m)	PBT* (£m)	EPS* (p)	DPS (p)	P/E (x)	Yield (%)
12/14	13.6	(10.4)	(0.41)	0.0	N/A	N/A
12/15	15.9	(16.6)	(0.49)	0.0	N/A	N/A
12/16e	27.5	(13.6)	(0.34)	0.0	N/A	N/A
12/17e	33.6	(8.7)	(0.15)	0.0	N/A	N/A

Note: *PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments.

Expanded capacity to trigger more deals

Novartis's use of the OXB's GMP-approved lentiviral vector manufacturing for its CTL019 programme is an important source of revenues (up to $76m over three years has been announced). The recently upgraded and extended capacity allows for the continued delivery of vectors to Novartis, with additional production utilised for OXB assets and new deals, eg Immune Design and Green Cross LabCell. Regulatory approval of CTL019 (Novartis expects to file the BLA in early 2017) could translate into a significant increase in delivery of vectors for its commercial launch, transforming OXB's business further as royalties on sales materialise.

Product spin-outs to optimise returns

With the recent strategic review, OXB intends to focus investment on the priority assets in its portfolio offering, notably OXB-102 (a more potent version of ProSavin for Parkinson's disease), OXB-202 (corneal graft rejection) and OXB-302 (multiple solid cancer indications). The near-term goal is to crystallise value from the internally developed product pipeline through an out-licensing or an externally funded spin-out approach.

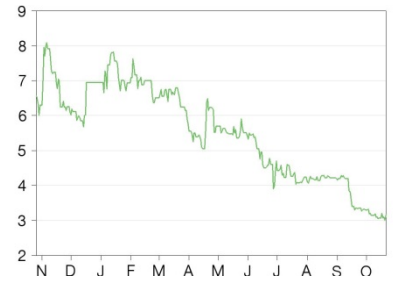
Valuation: Pipeline and production valued at £173m

Our revised valuation of £173m (previously £356m) or 6.2p/share reflects changes in our underlying assumptions on protracted launch timings for the pipeline and a reduction in our expectations for non-priority assets. Our rNPV model consists of the clinical-stage pipeline, coupled with a DCF value for OXB's manufacturing and IP income net of corporate costs and 2015 net debt. In the near term, valuation is underpinned by manufacturing deals. Furthermore, regulatory approval of Novartis's CTL019, with filing anticipated in 2017, could see significant further increase in demand for OXB vectors.

24 October 2016

Price	**3.16p**
Market cap	**£98m**
	$1.30/£
Net cash (£m) at end June 2016 (excl. £11.5m equity raise in September 2016)	11.9
Shares in issue	3,087m
Free float	100%
Code	OXB
Primary exchange	LSE
Secondary exchange	N/A

Share price performance



%	1m	3m	12m
Abs	(5.7)	(22.7)	(55.2)
Rel (local)	(7.7)	(26.4)	(59.1)
52-week high/low		8.1p	3.0p

Business description

Oxford BioMedica has a leading position in gene-based therapy. The lenti-vector technology is wide ranging and underpins much of the development pipeline, notably OXB-102, OXB-202 and OXB-302. OXB's manufacturing expertise, is gaining valuable commercial traction.

Next events

FY16 results	Q117
Further partnership deals	2016/17
Licensing deals/spin-outs	2017/18

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Edison profile page

Oxford BioMedica is a research client of Edison Investment Research Limited

Investment summary

Company description: Capabilities in place to deliver

Oxford BioMedica (OXB) is a UK biopharmaceutical company specialising in the development of gene and cell therapy. It has built an R&D pipeline based on its proprietary lenti-vector gene delivery system that uses lentiviral-derived vectors to convey genetic material into target cells. OXB was formed out of Oxford University and publicly listed on AIM in 1996 before moving onto the LSE in 2001. It has raised equity of c £190m since inception, with additional receipts of c £88m from partners, principally Novartis (CTL019) and Sanofi (including the now discontinued TroVax collaboration). OXB currently has c 250 employees. The strategic review announced at the full year 2015 results led to a prioritisation of resources on three internally developed assets that could deliver the best potential economic returns. The goal of each is to be advanced to at least proof of concept in humans via out-licensing or through formation of externally funded SPVs. The last year has seen significant resources directed towards upgrading and extending OXB's manufacturing and technical resources; lentiviral vector production capacity has increased substantially over the last 12 months. This expansion allows for the continued delivery of vectors to Novartis, with additional production utilised for OXB assets and the potential for further collaborative deals with new and existing partners. Furthermore, regulatory approval of Novartis's CTL019, filing anticipated in 2017, could see a significant further increase in demand for OXB vectors.

Valuation: Our model suggests £173m (6.2p/share)

Oxford BioMedica's longer-term outlook is dependent on continuing development of the internally developed product pipeline, the progress of which is contingent on out-licensing or creating externally funded SPVs. All told, the aggregate pipeline contributes ~30% to the group valuation, as in the nearer term our sum-of-the-parts valuation is highly geared to the value from the manufacturing, IP licensing and collaboration revenue streams. Our valuation of £173m (6.2p a share) is based on a DCF model of the projected manufacturing income streams (£138.3m or 4.5p a share), together with an rNPV model of the R&D and net of corporate costs and net debt. Progress in the clinical trials and/or securing partners/funding for the pipeline represent potential upside.

Sensitivities: Pipeline is early stage

Oxford BioMedica is subject to the usual biotech and drug development risks, including clinical development delays or failures, regulatory risks, competitor successes, partnering setbacks, and financing and commercial risks. The key sensitivities for OXB relate to crystallising value from the early-stage pipeline, given that both clinical development and partnering risks remain and we have limited visibility on the terms and timing of any potential deal(s)/creation of SPVs. The near term will be largely determined by delivery on the Novartis manufacturing deal, which should lead to sizeable revenue streams. The gross £11.5m equity fund-raising is a major consideration in the near term to ensure cash runway is sufficient to reach a value-creating point; further funding and value may arise from additional manufacturing or IP licensing deals.

Financials: Net £10m equity fund-raising aids cash runway

Oxford BioMedica reported net cash of £11.9m at the end of June 2016 which, with the net £10m equity raise in September (in addition to the £8.1m in equity financing raised in February 2016), coupled with our forecast for profitability at the EBITDA level in 2018, suggests the current cash runway runs beyond end 2017. Note that the £11.9m held includes $10m ring-fenced under the $50m loan facility from Oberland Capital. Furthermore other sources of revenue are being pursued, most likely from additional manufacturing collaborations, or the out-licensing of intellectual property.

Oxford BioMedica: Experts in gene and cell therapy

Oxford BioMedica is a leading player in gene- and cell-based medicines, with several programmes in the clinic, a proven delivery system and multiple GMP production facilities in place. OXB's commercial production of cell therapies is expected to continue to be a main source of revenue in the near term and lead to further contracts. Gene and cell therapy refer to the treatment of disease by delivering therapeutic DNA, or RNA in the case of lentiviral vectors (DNA that replaces/corrects a faulty gene or encodes for the expression of a therapeutic protein), into a patient's cells – either in the body (in vivo) or outside the body (ex vivo). OXB's main programmes centre on its proprietary lentiviral vector technology platform, which is a flexible and efficient gene delivery system that can be used to address genetic failings and so potentially transform the outcomes of many devastating diseases; the attraction of gene and cell therapy is the potential for single application treatment, leading to long-term or even permanent efficacy. The approach is promising, particularly in ophthalmic and certain neurological indications where delivery is relatively straightforward.

Oxford BioMedica's expertise with the various aspects of developing and commercialising lentiviral products continues to be recognised; as does the strength of its intellectual property (IP) relating to gene and cell therapy drug development. Progress in process development and manufacturing with the predicted efficiency and yield gains, has translated into an extension/expansion of the Novartis contract on CTL019; OXB has more recently commenced work on a second Chimeric Antigen Receptor T-cell (CART) programme for an undisclosed indication. Within IP deals the original Immune Design LV305 collaboration has been extended and GSK acquired IP licences for two additional rare disease product candidates. This year OXB has announced multiple new partnerships with Immune Design, Green Cross LabCell and MolMed; we expect the increase in capacity to attract new manufacturing partnering deals. We anticipate that contribution from the manufacturing side of the business will help the group significantly reduce the EBITDA loss in 2017 reach breakeven at the EBIT level in 2018.

We forecast manufacturing income streams through to 2029. In the main these are based on the Novartis contract being extended (assuming CTL019 is approved). The partnership with Novartis is focused around CTL019 (OXB is the sole supplier of the lentiviral vector for the CTL019 clinical study) and an undisclosed CAR-T programme is still set to provide up to $76m of performance-based milestones (we estimate between half to two thirds of the remaining $76m has been earned to date). These milestones are linked to an array of targets and we assume over $50m will be delivered. A regulatory approval for CTL019 could see production rates of the lentiviral vector used in CTL019 increase, which we believe could add significantly to OXB's revenue stream via royalty payments.

An internal review in April 2016 led to the prioritisation of three internally developed pipeline assets: OXB-102 (Parkinson's disease – Phase I/II), OXB-202 (corneal graft rejection – Phase I/II) and OXB-302 (cancer, multiple types – preclinical), which could deliver the best potential economic returns. The goal of each is to be advanced to at least proof of concept in humans via out-licensing or through formation of externally funded SPVs. Product candidates that fall outside the priority programme (OXB-201 for wet AMD and OXB-301 for multiple cancers) will only be progressed once suitable opportunities like partnering enable reduced investment from OXB. The group will continue to invest in earlier-stage gene and cell therapy concepts (eg in ocular, CNS and respiratory indication) with the aim of identifying new candidates for further development via out-licensing or spin-outs.

Nearer term, Oxford BioMedica's outlook and our sum-of-the-parts valuation are highly geared to the value from the manufacturing, IP licence and collaboration revenue streams, notably the fate and fortune of CTL019 (for multiple haematological malignancies including paediatric ALL and

diffuse large B-cell lymphoma). Novartis will file a BLA in early 2017 and OXB will receive royalties on product sales.

In-house gene therapy programmes back in focus

OXB has a broad product gene therapy-based pipeline including five wholly owned in-house developed assets plus two fully out-licensed products and a number of IP-enabled and royalty-bearing products. Exhibit 1 highlights OXB's product portfolio. Importantly in order to capture value of its Lentiviral based product portfolio OXB is seeking to out-license or spin out these products. The newly announced strategy takes into account the balance of risk versus reward for stakeholders (on the backdrop of the significant financial resources required over the next two to three years to advance OXB's value-driving assets to the next stage). Specifically in-house candidates OXB-102, OXB-202, OXB-302 (priority programmes), plus OXB-201 and OXB-301 will be spun out into one or more product-focused special purpose vehicles (SPVs), which are to be externally funded or will be out-licensed. OXB will look to obtain value through upfront payments/ equity stakes/ developmental milestone and royalty on sales. Furthermore in order to leverage off its manufacturing capability and expertise, OXB has indicated that under the terms of any deal it would require future partners to contract back to OXB any further vector engineering or process development, in addition to manufacturing requirements, for clinical studies and commercialisation.

Exhibit 1: OXB product pipeline

Product	Indication	Status	Notes/partner
Priority programmes to be spun out or out-licensed			
OXB-102	Parkinson's disease (CNS)	Phase I/II	To be spun out or out-licensed
OXB-202	Corneal graft rejection (ophthalmology)	Phase I/II	To be spun out or out-licensed
OXB-302	Cancer (multiple)	Preclinical	To be spun out or out-licensed
Other programmes to be spun out or out-licensed			
OXB-201	Wet AMD (ophthalmology)	Phase I/II	To be spun out or out-licensed
OXB-301	Cancer (multiple)	Phase I/II	To be spun out or out-licensed
OXB Partnered products			
SAR422459	Stargardt disease (ophthalmology)	Phase IIa	Licensed to Sanofi in Feb 2014
SAR421869	Usher syndrome type 1B (ophthalmology)	Phase I/II	Licensed to Sanofi in Feb 2014
IP enabled & royalty bearing products			
CTL019	Cancer (multiple)	Phase II/III	Novartis
Undisclosed CAR-T	Cancer (multiple)	Preclinical	Novartis
LV305	Cancer (multiple)	Phase II	Immune Design
Undisclosed	Undisclosed	Phase I/II	GlaxoSmithKline
Undisclosed	Undisclosed	Phase I/II	GlaxoSmithKline

Source: Edison Investment Research, Oxford BioMedica

OXB-102: New ProSavin shows promise in Parkinson's disease

OXB-102 is a gene-based therapy for Parkinson's disease (PD), which uses the proprietary lenti-vector system to deliver genes for three enzymes that help restore dopamine levels within the brain. Parkinson's disease is characterised by progressive loss of dopaminergic neurons within the basal ganglia in the brain, leading to a decline in dopamine levels. Since dopamine plays a critical role in movement and co-ordination, a reduction in its levels leads to the characteristic and progressive features of PD: tremor, slowness of movement and rigidity. This common neurological condition affected 2.25 million people in the US, Japan and the five main EU countries in 2012 (source: Globaldata 2015) and further growth will be driven by an increase in the ageing population. Importantly, many individuals are misdiagnosed or undiagnosed so the actual prevalence is likely higher. The current mainstay of drug treatment is limited to oral therapies such as Levodopa (L-DOPA), dopamine agonists and monoamine oxidase-B inhibitors, drugs that aim to increase or substitute for dopamine. However, over time the benefits of drug treatment diminish (L-DOPA provides symptomatic relief of around three to five years). Deep brain stimulation (DBS) is a

surgical technique (FDA approved in 1997) reserved for very advanced PD patients who have unstable L-DOPA response. The aim is to stabilise medication fluctuations and effectively control the erratic responses to Levodopa or to control the dyskinesias (involuntary movements) that do not improve with medication adjustments. DBS is not a cure, however, and does not address the progressive nature of PD. There is a significant unmet need for advanced PD patients who are no longer well controlled on L-DOPA.

Gene therapy could be the first therapy to slow disease progression in PD

A paucity of novel, effective drug treatments over multiple decades has paved the way for gene therapy as a promising potential treatment paradigm that could slow or even stop the progression of PD. These approaches have potential theoretical advantages, including specificity and long-term effectiveness (months to years), given the sustained delivery of biosynthetic enzymes directly to the brain parenchyma that aid in restoring dopamine levels. Through decades of research it has emerged that viral vectors are the more practical method to deliver these biosynthetic enzymes, with lentiviral and adeno-associated virus (AAV) approaches utilised in multiple clinical trials. It is postulated that lentiviral vectors may have an advantage over AAV due to the increased capacity of lentiviral vectors. It should be noted that, given the nature of the disease and the requirement to slow or stop progression, gene therapy as a class of therapeutic will have longer associated clinical trial programmes versus oral drug treatments.

OXB-102: A more potent version of ProSavin

OXB-102 is a more potent (up to 5x greater potency in preclinical models) form of original Parkinson's disease drug asset ProSavin/OXB-101, which is delivered locally to the brain striatum. ProSavin genes programme non-dopaminergic cells to produce dopamine and so help redress the imbalance of this essential neurotransmitter. The first patient in an open-label Phase I/II study using ProSavin was treated over five years ago and since then, 15 advanced-stage PD patients have completed in four escalating-dose cohorts (1x, 2x, 2x with a new technique, and 5x). There were encouraging results, with positive safety and efficacy data as measured by improvements in motor function. The four-year follow up data show that the improvements in motor function relative to baseline seen at six and 12 months has been sustained in the majority of the 15 patients originally treated, on the backdrop of a good safety profile. These observations have led to the development of a more potent version of ProSavin, OXB-102, which at fivefold the potency translates in pre-clinical models to a 10x increase in dopamine production. The rationale is that the more potent construct could lead to longer-term sustained duration of action (five to 10 years) following a single dose and it could also have utility at earlier, less advanced stages of PD. The OXB-102 study protocol approval is underway in the UK and OXB anticipates that, depending on the timing of successful out-licensing or spin-out, the first patient could receive treatment in the Phase I/II study in early 2017. This initial dose escalation study will evaluate three doses of OXB-102 with primary endpoints that include the incidence of adverse events following stereotactic injection of OXB-102 and efficacy endpoint of motor function (UPDRS III OFF score) at six months. The unified Parkinson's disease rating scale (UPDRS) is used to follow the longitudinal course of PD: "OFF" state refers to after the withdrawal of PD medication.

We note that US-based gene therapy company Voyager Therapeutics also has a PD gene therapy in early clinical stage (Phase 1) trials, highlighting the unmet need in PD. Voyager's approach is different to OXB given 1) the use of AAV compared to lentiviral vector; 2) targeting of the enzyme that synthesises Dopamine from its precursor L-DOPA (AADC – aromatic L-amino acid decarboxylase); and 3) drug delivery into the putamen. Clinical efficacy results have been mixed; however, at the more optimal dosing of 900 µl per putamen, encouraging efficacy data have been published.

Peak sales potential of $1bn in advanced PD patients refractory to oral meds

We have assumed a 20% probability of success given the early Phase I/II stage of development for OXB-102. Our peak sales forecast of $1bn (launch 2024) is based on a peak penetration of 7% of the addressable target patient population of advanced PD patients whose disease is not adequately controlled by oral medications (we assume to be ~4% of the diagnosed PD population – 2.25m patients in the US, Japan and top 5 EU; source: Global data 2015). We have assumed pricing at $100,000 per course given we expect one single administration to have the required long-term clinical benefit. The pricing range for gene therapies is difficult to forecast given a lack of precedent. UniQure launched the first gene therapy drug Glybera, an alipogene tiparovec based on adeno-associated viral vector (AAV) for lipoprotein lipase deficiency in Europe in 2015. The US FDA is yet to approve a gene therapy treatment and we note UniQure's decision to withdraw from seeking Glybera FDA approval following the agency's request for additional clinical trial data. Glybera's pricing of €1.1m per course (€44,000 per vial, average 19 vials per patient) has met with reimbursement challenges given the cost per patient versus efficacy. The 2010 market for oral 'dopamine based' drug sales for PD reported at $2.8bn (Datamonitor) and was expected to grow at a meagre 1% pa. We highlight that the market for PD has been mainly generic for many years, hence the relatively low current value; novel treatments that can slow or stop disease progression could have a positive impact on the PD market potential. We have assumed a blended royalty rate of 15% in our model and a launch trajectory of 2024. Our blended royalty rate is a simple proxy and does not place direct assumptions on upfront or milestone payments.

OXB-202: Demonstrable utility in corneal graft rejection

OXB-202 (previously known as EncorStat) is in development for the prevention of corneal graft rejection. Corneal graft or corneal transplantation is a surgical procedure where a damaged cornea is replaced by donated corneal 'graft' tissue. An estimated 70,000-100,000 corneal grafts (source: Apex report) are performed worldwide each year and around one in five patients who undergo a corneal graft will have an episode of rejection. Some patients are more at risk than others, eg patients with corneal revascularisation (blood vessels that have grown into the cornea from previous infections and inflammations) and those who have had prior corneal grafts or have pre-existing eye diseases such as glaucoma.

OXB-202 is a human donor cornea genetically modified with the same lentiviral vector as OXB-201 (RetinoStat) to secrete two proteins critical in the ant-angiogenesis process: endostatin and angiostatin. OXB-202 is used to treat the donor corneas ex-vivo prior to transplantation, with the aim to inhibit the neovascularisation responsible for graft rejection.OXB-202 has demonstrated encouraging results in pre-clinical models and is anticipated to start recruiting patients (up to 40) in Phase I/II clinical trials in 2017 at Moorfields Eye Hospital, a leading eye hospital in the UK, depending on the timing of successful out-licensing or spin-out.

Recently published phase I data of OXB-201 (RetinoStat) in 21 patients with neovascular age-related macular degeneration demonstrated that it was well tolerated with only one serious procedure-related adverse event (a macular hole that was resolved). Impressively expression of endostatin and angiostatin was maintained for 2.5 years in eight subjects and >4 years in two subjects; demonstrating significant long term transgene expression.

Peak sales potential of $381m in corneal graft rejection

We have assumed a 20% probability of success given the early Phase I/II stage of development for OXB-202. Our peak sales forecast of $381m (launch late 2026) is based on a peak penetration of 25% of the addressable target patient population of high-risk corneal graft patients, which we assume to be ~20% of the 70,000-100,000 global annual corneal graft procedures. We have assumed pricing at $50,000 per course given we expect one single administration to have the

required long-term clinical benefit. We highlight long-term data would need to be incorporated in product labelling to command our pricing assumption for this indication. We have assumed a blended royalty rate of 15% in our model and a launch trajectory of 2026.

CAR-T 5T4 cell therapy: OXB-302 for targeting solid cancer tumours

OXB-302 combines three technology platforms – LentiVector, 5T4 tumour antigen and CAR-T – for the development of a CAR-T 5T4 targeted therapy for the treatment of solid cancers. 5T4 is a heavily glycosylated cell surface protein that is expressed on a diverse range of cancer cells but demonstrates low levels of expression on non-cancerous tissues, making 5T4 an attractive target for therapeutic intervention. Expression of 5T4 ranges from 100% on metastatic prostate, lung, breast, renal and colorectal cancers to between 75-100% of the primary tumours. CAR-Ts are modified T-cells that express a chimeric antigen receptor (CAR) that is specific for a target protein. To create CAR-Ts a patient's T-cells are harvested then transduced with the lentiviral vector encoding for a particular receptor, in this case 5T4. These cells are then expanded and infused back into the patient where they search for the cells expressing 5T4, effectively hunting out the cancerous cells to destroy them. This therapeutic class has demonstrated some exceptional efficacy, counter balanced by a high incidence of severe side effects. OXB-302 is currently in preclinical trials and the preclinical work is on track to be completed by the end of the year. We therefore currently do not include any sales expectations for the product given its early stage in development and the intense competition in the CAR-T space. We highlight this programme as one to watch as it progresses into clinical trials given the magnitude of patients with solid tumours; a successful CAR-T therapy could ensure blockbuster sales potential.

Other research programmes have value for out-licensing

While we believe OXB will be initially more successful in spinning out priority assets as described above, OXB also has a number of other interesting assets (OXB-301 for cancer and OXB-201 for wet age-related macular degeneration [AMD]). Previously management has made clear that advancement of these assets is contingent on securing an external funding partnership. Management continues to look to realise value through out-licensing or spin-out.

OXB-301 (previously known as TroVax) is a therapeutic vaccine that stimulates the immune system to target and destroy cancerous cells that express the 5T4 tumour antigen, which is common to many solid tumours. Results from 10 previous clinical trials in over 500 colorectal, renal and prostate cancer patients have shown that it demonstrates clear indications of efficacy and, importantly, can be combined with various other treatments (eg checkpoint inhibitors). Four investigator-led Phase I/II and II studies are underway; results from the colorectal cancer study and the mesothelioma study are expected in 2016. This approach has used minimal internal resources and existing drug supply (which had been built up in anticipation of previously planned Phase III studies).

OXB-201 (previously known as RetinoStat) is a gene-based anti-angiogenesis treatment for neovascular wet AMD that uses the LentiVector platform to deliver two genes that encode the anti-angiogenic proteins directly to the retina by injection. Results from a 21-patient Phase I announced at ARVO in May 2015 showed that OXB-201 met the primary endpoints of safety and tolerability. Patients demonstrated signs of clinical benefit, with visual acuity stabilisation and reduction in vascular leakage observed. The observation was in line with the mechanism of endostatin and angiostatin function in vivo.

Patents: A number of players may have to license OXB IP

As one of the pioneers in the field, Oxford BioMedica has a broad patent estate, with a multi-layered portfolio covered by over 100 issued or pending patents in key jurisdictions that protect the technology platform and the individual product candidates. Some of these patents extend into 2023. Three companies have already signed licence agreements, eg GSK has taken an option for a non-exclusive licence for the lenti-vector technology patents for use in up to six undisclosed orphan diseases. A new and expanded collaboration with Immune Design Corp was announced more recently; the licence involves the use of lentiviral vector-based products for the in vivo treatment or prevention of cancer (financial and other terms have not been disclosed). Further licensing agreements are expected to be struck as these drug candidates progress along their clinical pathways. Sanofi has taken exclusive licences to SAR422459 (Stargardt disease) and SAR421869 (Usher syndrome type 1B), and is responsible for full development and commercialisation; OXB will receive milestone payments and royalties on future sales (we assume a 7% royalty rate). Both are rare conditions for which US and EU orphan drug designation has been granted. Sanofi is responsible for the full development and commercialisation programmes for both. Encouragingly SAR422459 has recently entered into a Phase IIa trial, while SAR421869 is currently in Phase I/II trials.

Lentiviral vectors: A technology primer

Lentiviruses like HIV can infect human cells; once inside the cytoplasm of a cell they utilise their own reverse transcriptase to make DNA from their single stranded RNA genome. This DNA is then integrated into the genome of the host. Unlike some viral systems, lentiviruses have an ability to infect both mitotic (dividing) and post-mitotic (non-dividing) cells. Post-mitotic cells are unable to be infected by most retroviruses, which give lentiviruses a unique advantage; however, competing technologies do exist such as adeno-associated viruses, which are able to infect non-dividing cells. Post-mitotic cells include neuron and muscle cells that can be found in the brain, heart and skeletal muscle. These cells are key targets for neurological and cardiac diseases.

Lentiviral vectors and viral vectors in general are modified viruses that efficiently infect a target cell but are rendered replication deficient. Replication deficient viral vectors are a must; as such, regulatory requirements covering lentiviral technology are strict, ensuring that generic CMOs and biotech companies entering the field have a high technical barrier to entry. Under FDA rules, for lentiviral vector products to be utilised in humans, there must be an absence of replication-competent lentivirus. Lentiviral vectors have evolved through multiple generations as they have been modified to become safer and more efficient. The generations are defined by what genes of the lentivirus are retained and how they are packaged. The most recent third-generation vectors removed all accessory genes that aided in virulence and pathogenicity while splitting the remaining genes, which are vital for expression of the transgene across three plasmids.

Competing technologies

Competition in the gene therapy is increasing and this is exemplified by the choice of virus in viral infection systems. Adenoviruses and adeno-associated viruses (AAV) present a major alternative to lentiviral systems. Both can infect non-dividing and dividing cells but adenoviruses expression is transient in nature. Adenoviruses do not integrate into genome; the DNA molecule is still transcribed, however it is not replicated during cell division, which results in limited long-term expression. The body also has an innate immune response to adenoviruses that limits the efficacy of the technology. Common adenovirus infections include tonsillitis, gastroenteritis and conjunctivitis.

While AAV do not integrate into the host genome, they can potentially have a long-lasting effect similar to that of lentiviruses due to long-term expression that can be achieved by episomal monomeric and concatemeric circles. Uniquely, AAVs demonstrate distinct serotypes which are specific to certain tissue types; however, lentiviral vectors can be altered to infect either a specific cell type or broader range of cells. While this can be a powerful advantage for AAV over other viruses as it allows a degree of specific targeting, it can also be a disadvantage as low transduction efficiency can occur if the wrong serotypes are utilised. Many biotech companies are involved in the AAV sector, with one of the most advanced being Spark Therapeutics (ONCE), which in 2015 announced positive Phase III results for its AAV-based product focused on genetic blinding conditions. Spark aims to file a Biologics Licence Application with the FDA this year.

OXB's lentiviral technology

OXB's lentiviral vectors are based on the equine infectious anaemia virus (EIAV). While the exact modification will depend on the application; most recent developments will be proprietary in nature. However, we assume that current technology is based on a third generation vector system where the accessory genes are removed and the genome is split among plasmids. Safety is paramount and like all lentiviral vectors, EIAV based vectors are made replication incompetent. In addition, EIAV unlike HIV is an equine based virus and is not pathogenic in humans. OXB has developed the technology for 20 years and the lentiviral platform has been involved in multiple trials, which demonstrate its efficacy and safety. For example, OXB-101 (ProSavin) demonstrated benefits in a small 15-patient study for treatment of PD. All patients demonstrated an improvement in baseline after six and 12 months, which were sustained in some patients for four years.

OXB manufacturing capabilities validated by multiple partners

Large-scale production of viral vectors is key to the long-term commercial success of the technology and OXB has 20 years of experience with its lentiviral technology. One bottleneck is cell line generation. This is the process of integration of a transgene into a parental cell line before cloning. The clones are then screened and selected before they are expanded. This process can take 12 weeks when manually performed and results in 100-200 screen clones. OXB's automated cell screening system (ACSS) performs this in eight weeks with up to 3,000 clones screened. The recent completion of the Windrush Court laboratories, combined with the upgraded bioprocessing facilities at Harrow House and Yarnton gives OXB the capacity to meet ongoing demand for its Lentiviral expertise. The company has built a solid reputation for manufacturing commercial quantities of cell- and gene-based medicines and it is expected to be its main source of revenues in the near term.

OXB's GMP manufacturing facilities have recently been expanded and consist of three operational clean room facilities with 1,200m^2 of capacity across two sites, while OXB's newest facility at Windrush Court brings 2,136m^2 of laboratories online. The continued licensing and manufacturing partnership with Novartis, along with the licensing agreements with Sanofi, Immune Design and GSK provide external validation of the technology platform. In 2015 OXB had its only operational facility (GMP1 – Harrow House) running at capacity; the addition of a second clean room facility (GMP2) at Harrow House (MHRA approved) and a third facility at the Yarnton facility (GMP4) (MHRA approved) more than doubles manufacturing capacity. GMP2 at Harrow House is dedicated to OXB's next generation lentiviral vector manufacturing process, a serum-free 200 litre bioreactor. Several Novartis vector batches are expected to be manufactured with this new process in the next six months. OXB estimates the new process is 10-20 times more productive than the cell factory process, thus the manufacturing cost of producing a patient dose should be significantly reduced. Multiple manufacturing facilities importantly increase the robustness of the supply chain while allowing capacity for further products and partnerships to be developed.

Away from manufacturing, OXB's R&D facilities have been majorly expanded and upgraded with introduction of the Windrush facility, which has recently come online. It brings further capabilities to analytics, quality control and process development. We expect OXB's production of Novartis's lentiviral technology to dominate OXB's manufacturing output with GMP1 and GMP2 fully dedicated to Novartis. The £26m capacity expansion completed in 2016.

Novartis collaboration CTL019: CAR-T and lentiviruses

CTL019 is an investigational chimeric antigen receptor T-cell (CAR-T) therapy, which Novartis is testing across multiple Phase II trials. OXB's lentiviral technology is utilised to enable the chimeric antigen receptor expression on the T-cell. T-cells are isolated from the patient and are then modified ex vivo with lentiviral vector. The lentiviral vector encodes for the anti-CD19 chimeric antigen receptor. These chimeric antigen modified t-cells (CAR-T) are then expanded before infusion back into the patient.

Novartis plans to file CTL019 for marketing approval in the first quarter of 2017 for paediatric patients with acute lymphoblastic lymphoma (ALL). It received breakthrough therapy status for CTL019 in relapsed refractory acute lymphoblastic leukaemia (r/r ALL) in 2014, which could potentially see it rapidly progress to market based on positive Phase II results.

Changes in the regulatory landscape both in Europe with the launch of PRIME (March 2016) and in the US with the introduction of 'breakthrough therapy designation' in 2012 allow for innovative therapeutics that demonstrate major therapeutic benefit to reach the market faster than under standard regulatory approval pathways. Recently in June, the EMA granted PRIME designation to CTL019 for the treatment of paediatric patients with ALL.

The partnership with Novartis focused around CTL019 and an undisclosed CAR-T programme is still set to provide up to $76m of performance-based milestones ($14m of the $90m deal signed in 2014 have been paid to date). These milestones are linked to an array of targets and we assume over $50m will be delivered. OXB's lentiviral vector is a key component of CTL019 and a regulatory approval (potentially in 2017) for it could see a dramatic uplift in lentiviral vectors needed. We believe this could add significantly to OXB's revenue stream as an increase in demand from Novartis could see a significant uplift in revenues for OXB. Novartis is at present dependent on OXB for vector supply, which is a critical part of the CTL019 manufacturing process. Additionally we expect royalties from the sale of CTL019 to become substantial as sales progress. We estimate that Novartis will launch CTL019 for DLBCL and paediatric ALL in 2017 with combined royalties expected in 2017 of £978k and peak combined royalties in 2023 of £12.4m. We assume Novartis can capture 20% of the refractory DLBCL market and 30% of the refractory paediatric ALL market with an average £150k price. We believe increased competition from Kite and Juno in DLBCL will drive lower market share, but both are lagging behind Novartis on plans to launch in paediatric ALL. We assume OXB receives royalty on sales of 1% on both indications.

CTL019 has demonstrated some remarkable efficacy data to date; however, this has been met with concerns about its safety profile (and the CAR-T field in general) and questions on how sustained the efficacy is. These concerns are present with CAR-Ts from all three main players (Kite, Juno and Novartis). Data presented by Novartis highlight the effects CTL019 can have in paediatric r/r ALL. After one month, 50 out of 53 patients were in complete remission. However, c 25% of patients who received CTL019 demonstrated limited persistence. While repeat administration of CTL019 aided some patients, others were resistant to treatment. A next-generation treatment, CTL119, was tested in five patients who had progressive disease; two patients responded who earlier demonstrated resistance to CTL019. Another trial demonstrated impressive efficacy but showed that 88% of patients (52 out of 59) developed grade 1-4 cytokine release syndrome. CRS typically causes flu-like symptoms but can become more severe with low blood pressure and breathing difficulties. Treatment was needed in 27% of patients for hemodynamic or respiratory instability.

Three's a crowd

Novartis (CTL019), Kite Pharmaceuticals (KTE-C19) and Juno Therapeutics (JCAR015) are all expected to file for marketing approval with the FDA for their CD-19 targeting CAR-Ts by the end of 2017. Kite has recently announced positive results from interim analysis of its ZUMA-1 trial testing its CD-19 CAR-T (KTE-C19) in patients with chemorefractory diffuse large B-cell lymphoma (DLBCL). 47% of patients (n=51) demonstrated a complete remission, with this falling to 33% at three months. Long-term Phase II data has yet to be collected, although the Phase 1 component of the ZUMA-1 trial demonstrated the same complete remission rates at month three as months six and nine, however in much smaller patient numbers (n=7).

Additional data was also collected in 11 patients with transformed follicular lymphoma (TFL) and primary mediastinal B-cell lymphoma (PMBCL). Complete remission was 73% and 64% at three months. While it demonstrated impressive efficacy, adverse events were severe and common, however they are in line with what has been previously observed. Most common grade 3 or higher adverse events were neutropenia (66%), anaemia (40%) and febrile neutropenia (29%) with grade 3 or higher cytokine release syndrome (CRS) and neurological toxicity observed in 18% and 34% of patients. Two patients died due to treatment related adverse events (cardiac arrest resulting from CRS and hemophagocytic lymphohistiocytosis).

Kite plans to file on initial data from the ZUMA-1 trial by year end. It is unclear how the FDA will view this data package, particularly what will be considered suitable efficacy and safety. A meta-analysis performed by KITE (SCHOLAR-1) of outcomes from chemorefractory DLBCL patients was presented at ASCO. It observed that patients had a median overall survival of 6.6 months and overall response rate was 26%, with 8% achieving a complete response. Kite aims to use this as a benchmark for its KTE-C19 filing.

Following Juno Therapeutics' setback in July where three patients died as a result of neurotoxicity, Juno has had its plans to file pushed back. While the trial was restarted on FDA approval after less than a week, Juno does not expect to file for regulatory approval until later in 2017 in adult ALL patients with a potential launch in the first half of 2018. While CRS related side effects have been well reported in trials to date, the death of these patients due to neurotoxicity took the industry by surprise in July this year. The finger was quickly pointed towards the use of fludarabine as a preconditioning agent and the FDA was quick in reinstating the trial less than a week later, highlighting the promise the FDA sees in these treatments. Wider neurotoxicity concerns remain for CAR-T treatments, but the efficacy for all three CAR-T products remains impressive in patient populations with few treatment options available.

Sensitivities

Oxford BioMedica is subject to the usual biotech and drug development risks, including clinical development delays or failures, regulatory risks, competitor successes, partnering setbacks and financing and commercial risks. A key longer-term sensitivity for OXB relates to it crystallising value from the early stage pipeline. Both clinical development and partnering risks remain and we have limited visibility on the terms and timing of any potential deal(s). These include the unpredictable outcomes of clinical trials (where the results are often binary in nature), the risks of development or regulatory delays (for instance, the FDA requiring additional clinical data), unexpected changes in clinical practice, an altered re-imbursement environment and limited funds (where a delay can result in the cash runway being insufficient to reach a value-creating point). Furthermore, the company has been investing around £26m in establishing a GMP facility (and the associated infrastructure) to manufacture cell- and gene-therapy products at commercial scale. The rationale is sound, with the potential to use spare capacity for third-party production offering the prospect of an additional revenue stream. OXB is highly exposed to any potential delay or cancellation of

Novartis's CTL-019; this would entail incurring operating costs (estimated at greater £2m pa) until the surplus capacity was utilised.

Valuation

Our sum-of-the-parts valuation consists of an rNPV model of the R&D pipeline, coupled with a simple DCF valuation of the projected manufacturing revenues and our forecast licence income and IP royalties and milestones (Exhibit 2). Our revised valuation of £173m (previously £356.1m) or 6.2p/share reflects a number of changes to our underlying assumptions. Foremost, given the group's intention to out-license/spin out its priority and non-priority assets, we have delayed our anticipated launch trajectories across the portfolio by a few years. Additionally, we have applied a blended 15% royalty rate as a simplified method to capture the potential deal economics of an out-licensing agreement or spin-out. Furthermore, as detailed in the note, we have applied a top-down analysis of the Parkinson's disease and corneal graft rejection markets, which form the basis of our sales projections for clinical stage, priority assets OXB-102 and OXB-202, respectively.

Exhibit 2: OXB sum-of-the-parts valuation

Product(s)	Indication	Partner	Status	Probability of success	Estimated launch year	Estimated maximum royalty or margin	Estimated peak sales ($m)	NPV (£m)	rNPV (£m)	rNPV/ share (p)
OXB-102	Parkinson's disease		Phase I/II	20%	2024	15%	$1,048.1	119.0	23.8	0.84
OXB-202	Corneal graft rejection		Phase I/II	20%	2026	15%	$381.3	33.5	6.7	0.24
OXB-201	Wet AMD		Phase I/II	20%	2026	15%	$337.5	44.4	8.9	0.31
OXB-301	Cancer (multiple)		Phase I/II	20%	2024	15%	$360.0	28.1	5.6	0.20
SAR422459 (StarGen)	Stargardt disease	Sanofi	Phase IIa	25%	2021	7%	$337.5	29.3	7.3	0.26
SAR421869 (UshStat)	Usher syndrome type 1B	Sanofi	Phase I/II	20%	2023	7%	$45.0	3.8	0.8	0.03
Manufacturing (including CTL019)		Various		100%		40% operating margin	$75.4	103.5	103.5	3.66
Licence income & IP milestones		Various		100%		100% operating margin		34.8	34.8	1.23
Less net debt								17.9	17.9	0.52
Total								378.5	173.4	6.24

Source: Edison Investment Research. Note: *Sanofi has fully licensed – we estimate 7% royalty rate on forecast product sales. rNPV = risk-adjusted NPV.

Our DCF model for the manufacturing income streams forecasts the lentiviral production revenues (OXB solution) through to 2029. We separately model milestone and licence income to reflect the value of Novartis CTL019 (potential incoming royalty stream from CTL019 should the Novartis contract be extended; assuming CTL019 is approved) and other deals, eg Immune Design and Green Cross LabCell. These are summed and discounted at 10%, in line with other revenue generating units under Edison coverage. We estimate that Novartis will launch CTL019 for DLBCL and paediatric ALL mid to late 2017 with combined royalties expected in 2017 of £978k and peak combined royalties in 2023 of £12.4m. We assume OXB will be due a 1% royalty on sales for both indications.

The risk-adjusted value of the pipeline is £53.1m, equivalent to 1.9p a share, and is based on conservative assumptions in terms of timings and adoption curves. The success probabilities of each project are based on standard industry criteria for each stage of the clinical development process but are flexed to reflect the inherent risks of the individual programme, the indication targeted, and the trial design. We use a 12.5% discount rate, which is our standard rate for such early-stage companies, and we net out the debt position. Importantly, we have chosen not to

include the value of other less visible, but arguably just as important assets such as the intellectual property estate (which should lead to milestones and royalties under various technology IP licensing deals).

Financials

Oxford BioMedica reported H116 gross income (the aggregate of revenues and other operating income) of £14.0m, an increase of 141% from £5.8m in H115, driven by higher bioprocessing and process development income due mainly to process development activities for Novartis (CTL019). OXB has been manufacturing CTL019 at the new clean room facility at Yarnton from the start of the year in addition to ongoing manufacturing at Harrow House. R&D collaboration revenues (licence, milestone and grant income) increased slightly to £1.5m in H116 (£1.4m in H115) related to higher process development fees and milestones from Novartis and the receipt of the upfront payment related to the Immune Design deal announced in March 2016. We forecast 2016 and 2017 gross income of £29.5m and £34.6m, respectively, driven by higher bioprocessing income; our forecasts only include known revenue streams (with potential licensing, partnering or manufacturing deals representing upside).

R&D and bioprocessing costs increased to £16.1m in H116 (£11.7m in H115), and we expect a further uplift in these expenses in 2016 to £20.0m; however, from 2017 we forecast a significant reduction reflecting the near-term strategy to out-license or spin out the product portfolio (£16.5m in 2017 and £14.5m in 2018). We forecast a small rise in administrative costs (+5%) due to higher staffing levels as a result of manufacturing business expansion. We expect a decrease in operating loss in 2016 to £9.6m from £14.1m in 2015, and we expect the increase in bioprocessing and partner income and the reduction in R&D expenses from 2017 onwards to bring the group closer to break-even at the EBITDA level. We forecast a small loss at the EBITDA level in 2017 and a profit of £3.6m at EBITDA level in 2018.

Finance costs increased significantly in H116 reporting at £2.4m related to the Oberland loan facility ($25m drawn down in May, $15m in September 2015). The Vulpes and AMSCI loans were fully repaid in 2015. In cash terms, net cash generated from operations came in at £0.25m in H116 compared to a £9.2m outflow in H115 (mainly due to positive working capital movement), offset by a rise in non-cash items such as depreciation, amortisation, impairment and share options. Capex increased slightly, to £6.0m in H116 (£4.6m in H115), due mainly to investment in assets under construction relating to the expansion work at Harrow House, Yarnton and Windrush Court. The capital expenditure on capacity expansion is being financed by the Oberland loan facility: ~£40m has been drawn down to date. As a result, free cash flow (net operating cash flow less capex) for the period was £5.7m vs £13.9m in H115, the differential mainly accountable by capex. We would anticipate 2016 cash burn to improve over 2015, given lower capex requirements offset by higher R&D needs. From 2017 onwards we expect cash burn to reduce significantly reflecting the reduction in capital requirements associated with plant expansion and R&D. The significant reduction in cash burn coupled with moving towards profitability in 2018 means the recent equity raise of a net £10m should ensure sufficient cash to end 2017 and beyond.

Note that in May 2015 Oxford BioMedica secured a $50m loan facility from Oberland Capital as non-dilutive funding to progress its manufacturing expansion. The loan has to be repaid by 1 May 2022, but may be paid at any time (an undisclosed fee is payable upon any repayment). Interest is payable quarterly at an annual rate of 9.5% plus the greater of 1% or three-month Libor. A further 0.35% of net revenues is payable for eight years starting on 1 April 2017 for each $5m drawn down over $30m (this may be closed at any time but an undisclosed exit fee is payable). An initial $25m was drawn down immediately to fund the production expansion required for the Novartis contract and a further $15m was drawn down in September 2015. The remainder is available in tranches of

a minimum of $5m prior to 31 December 2016. Due to the restrictive nature of the Oberland facility it can only be utilised for manufacturing expansion. The group is required under the Oberland Facility to maintain cash and cash equivalents of not less than $10m while the Oberland loan is outstanding. The loan facility is secured on the group's assets.

Exhibit 2: Financial summary

£'000s	2014	2015	2016e	2017e	2018e
Year end 31 December	IFRS	IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS					
Revenue	13,618	15,909	27,500	33,600	38,190
Cost of Sales	(4,416)	(5,839)	(12,200)	(15,240)	(17,076)
Gross Profit	9,202	10,070	15,300	18,360	21,114
R&D	(16,986)	(20,274)	(20,000)	(16,500)	(14,500)
Other operating income	1,128	2,862	2,000	1,000	1,000
EBITDA	(9,514)	(12,456)	(6,760)	(995)	3,556
Depreciation	(703)	(1,264)	(2,592)	(3,193)	(3,176)
Operating profit (before GW and except)	(10,217)	(13,720)	(9,353)	(4,188)	380
Amortisation	(396)	(363)	(291)	(242)	(202)
Exceptionals	0	0	0	0	0
Operating profit	(10,613)	(14,083)	(9,643)	(4,430)	178
Net Interest	(185)	(2,899)	(4,266)	(4,468)	(4,679)
Other	0	0	0	0	0
Profit Before Tax (norm)	(10,402)	(16,619)	(13,619)	(8,656)	(4,299)
Profit Before Tax (reported)	(10,798)	(16,982)	(13,909)	(8,898)	(4,501)
Tax	2,137	3,963	4,000	4,000	4,000
Profit After Tax (norm)	(8,265)	(12,656)	(9,619)	(4,656)	(299)
Profit After Tax (reported)	(8,661)	(13,019)	(9,909)	(4,898)	(501)
Average Number of Shares Outstanding (m)	2,019	2,574	2,831	3,087	3,087
EPS - normalised (p)	(0.41)	(0.49)	(0.34)	(0.15)	(0.01)
EPS - reported (p)	(0.43)	(0.51)	(0.35)	(0.16)	(0.02)
Dividend per share (p)	0.00	0.00	0.00	0.00	0.00
Gross Margin (%)	67.6%	63.3%	55.6%	54.6%	55.3%
EBITDA Margin (%)	(69.9%)	(78.3%)	(24.6%)	(3.0%)	9.3%
Operating Margin (before GW and except) (%)	(75.0%)	(86.2%)	(34.0%)	(12.5%)	1.0%
BALANCE SHEET					
Fixed Assets	11,050	26,139	30,256	27,821	25,443
Intangible Assets	2,106	1,743	1,453	1,210	1,009
Tangible Assets	8,944	24,396	28,804	26,610	24,434
Current Assets	22,755	25,712	31,725	31,854	35,227
Stocks	1,407	2,706	4,178	5,219	5,848
Debtors	5,153	10,930	6,986	7,545	8,677
Cash	14,195	9,355	17,276	15,805	17,418
Other	2,000	2,721	3,284	3,284	3,284
Current Liabilities	(9,231)	(13,169)	(14,423)	(15,669)	(15,757)
Creditors	(6,304)	(9,286)	(9,192)	(10,438)	(10,526)
Provisions	0	(838)	(838)	(838)	(838)
Deferred income	(2,927)	(3,045)	(4,393)	(4,393)	(4,393)
Long Term Liabilities	(1,535)	(27,788)	(29,072)	(30,417)	(31,825)
Long term borrowings	(1,000)	(27,255)	(28,539)	(29,884)	(31,292)
Other long term liabilities	(535)	(533)	(533)	(533)	(533)
Net Assets	23,039	10,894	18,486	13,588	13,087
CASH FLOW					
Operating Cash Flow	(7,431)	(14,871)	(3,035)	(1,348)	1,884
Net Interest	(238)	(1,494)	(2,997)	(3,138)	(3,286)
Tax	1,637	3,247	3,437	4,000	4,000
Capex	(5,577)	(16,716)	(7,000)	(1,000)	(1,000)
Acquisitions/disposals	0	0	0	0	0
Financing	22,582	144	17,501	0	0
Dividends	0	0	0	0	0
Other	53	38	15	15	15
Net Cash Flow	11,026	(29,652)	7,921	(1,471)	1,613
Opening net debt/(cash)	(2,169)	(13,195)	17,900	11,263	14,079
HP finance leases initiated	0	0	0	0	0
Other	0	(1,443)	(1,284)	(1,345)	(1,409)
Closing net debt/(cash)	(13,195)	17,900	11,263	14,079	13,875

Source: Oxford Biomedica, Edison Investment Research

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Management team

CEO: John Dawson	CFO: Tim Watts
Joined as non-executive director in August 2008; appointed CEO in October 2008 (acting CEO from August to October 2008). Previously at Cephalon (2008-14), including as CFO and head of BD Europe.	Joined as CFO in February 2012. Previously CFO at Archimedes Pharma (2007-11) and spent 22 years at ICI, moving to FD of Zeneca Pharmaceuticals and then group financial controller of AstraZeneca in 2001.
Chairman: Dr Lorenzo Tallarigo	
Joined as non-executive chairman in February 2016. Previously on the board of Intercept (2008- 2014) and chairman of Intercept (from 2011), CEO of Genextra (2009-14) and CEO and president of international operations at Eli Lilly (1985-2008).	

Principal shareholders	(%)
M&G Investment Managers	18.2
Vulpes Life Sciences	17.6
Aviva	10.5
Joy Group	8.7
L&G Investment Management	2.7
Novartis	2.6

Companies named in this report

Sanofi (SAN FP), Novartis (NOVN VX), GlaxoSmithKline (GSK), Juno therapeutics (JUNO) , Bluebird bio (BLUE), Spark Therapeutics (ONCE), Voyager Therapeutics (VYGR), UniQure (QURE)

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