EDISON

Abzena

ThioBridge deal

Significant licence deal with US biotech

Pharma & biotech

Abzena has recently achieved a significant licensing deal for its proprietary site-specific ThioBridge antibody drug conjugate (ADC) linker technology with a San Diego-based biopharmaceutical company. The agreement covers the use of ThioBridge in up to 10 ADCs across a wide range of indications and a service agreement. This provides important validation of Abzena's proprietary ADC technology and hybrid business model. Our rNPV valuation increases to £117m following inclusion of the 10 ADCs now being developed through this deal.

Year end	Revenue (£m)	PBT* (£m)	EPS* (p)	DPS (p)	P/E (x)	Yield (%)
03/15	5.7	(4.7)	(5.89)	0.0	N/A	N/A
03/16	9.9	(7.5)	(6.00)	0.0	N/A	N/A
03/17e	19.1	(8.2)	(5.16)	0.0	N/A	N/A
03/18e	25.0	(5.7)	(3.55)	0.0	N/A	N/A

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

ThioBridge licensing deal

Abzena announced a significant licensing deal with a San Diego-based biopharmaceutical company for its novel site-specific ThioBridge technology, which links antibodies/proteins to cytotoxic agents, and a master services agreement to use its chemistry services. The licensing deal includes the use of ThioBridge in up to 10 ADCs across a wide range of indications. According to the company, the value of the agreement has the potential to reach more than $300m in development/ commercial milestones if the partner successfully develops the ADC products. Alongside this, Abzena would also receive royalties on sales of any approved products that incorporate the ThioBridge technology.

Continued validation of business model

This is the second ADC deal announced with a significant biopharmaceutical company and importantly this deal includes the addition of the use of Abzena's chemistry services division, which we believe underpins our current forecasts. This provides validation of Abzena's offering and leveraging a broader service, whilst maintaining potential upside as products progress through the clinic (Abzena *inside*).

Valuation: Raised to £117m or 85p per share

We have increased our valuation to £117m (from £112m) or 85p per share (vs 82p). This is principally due to the inclusion of the 10 potential ADC products resulting from the recent (January 2017) ThioBridge agreement. We expect Abzena to gain greater deal economics from its ADC products due to the greater technological and IP input resulting from ThioBridge and therefore include a higher royalty rate (2.5%) than its antibodies developed using its Composite Human Antibody technologies (1%). We believe Abzena is well positioned to grow its integrated service offering and, as its Abzena *inside* products move through the clinic and onto the market, we expect upside to our current estimates.

7 February 2017

Price	**40.50p**
Market cap	**£56m**
	$1.24/£
Net cash (£m) at 30 September 2016	9.4
Shares in issue	137.8m
Free float	39%
Code	ABZA
Primary exchange	AIM
Secondary exchange	N/A

Share price performance

%	1m	3m	12m
Abs	12.5	17.4	(18.2)
Rel (local)	12.9	9.6	(32.5)
52-week high/low		56.0p	32.5p

Business description

Abzena is a UK group that offers a range of services and technologies for biopharmaceutical development including immunogenicity tests, protein engineering, bioconjugation, polymer/synthetic chemistry, biomanufacturing and ADC chemistry.

Next events

Further Abzena *inside* products into the clinic	2017
Roche update SDP051	2017
Phase III GS-5745 futility analysis in Gastric Cancer	H217

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Edison profile page

Investment summary

Company description: Building better biologicals

Abzena provides biological research services aimed at creating more effective and safer biological products. The group initially evolved through the combination of three key businesses: PolyTherics, Antitope and Warwick Effect Polymers. More recently, it has also acquired PacificGMP (contract, development and manufacturing) and TCRS (specialist contract chemistry and bioconjugation). This enables Abzena to offer a more comprehensive and integrated offering. Abzena listed on AIM in July 2014 (raising £20m) and in 2015, from a secondary placement, raised £20m net of expenses from the sale of 35m new shares at 60p. The group is primarily based on the Babraham Research Campus in Cambridge (UK) and, following two acquisitions in 2015, has operations in San Diego (PacificGMP) and Philadelphia (TCRS). The company employs c 200 staff.

Valuation: £117m (85p/share) on services/royalty mix

Our fair value is adjusted to £117m (from £112m) or 85p per share (vs 82p), based on a three-phase DCF of the services business (£48m) and risk-adjusted royalties from existing and future licensed products (£60m). We include H117 cash of £9.4m. For future royalty revenues we estimate peak sales, launch dates, probabilities of success and small royalties (up to 1%) for the programmes in clinical development (there are currently 11 of these programmes in our model). We also include 13 preclinical ADC projects (vs three previously) following the recent San Diego biopharmaceutical company deal announced in January 2017. We expect better deal economics from the ADC candidates and as a result we estimate a 2.5% royalty. Further newsflow from the progression toward royalties from its Abzena *inside* products, further service contract deals and/or ThioBridge deals will provide upside to our current estimates.

Financials: Integrated service offering demonstrating value

We have not altered our forecasts, maintaining revenue at £19.1m for FY17 and £25.0m in FY18 and PBT loss of £8.2m and £5.7m in FY17 and FY18 respectively. While the recent ThioBridge deal has not had an impact on our near-term forecasts, the inclusion of the use of Abzena's chemistry services in the deal provides comfort that the forecasts will be met. H117 reported cash was £9.4m, which we currently forecast will reach into FY18. We expect a financing requirement in that year and for illustrative purposes include £10m debt in FY18. We also expect capex to increase (FY17 £4m vs FY16 £2m), as the company invests in expanding its GMP manufacturing capacity in San Diego and chemistry services in Bristol (US).

Sensitivities: Low-risk business model

With stable and growing revenues from its services business and a licensed portfolio of drugs that does not require investment to develop, Abzena operates a relatively low-risk business model. However, the biological services industry is highly competitive and will require Abzena to continually invest in enhancing its technologies and offering to the sector, which may require development and/or purchasing further assets. Having acquired two manufacturing businesses at the end of 2015 to expand its offering, it is integrating and embedding the broader offering, which is not without risk. While potential future royalty revenues on sales of products developed using Abzena's technologies appear to offer pure upside, the development of these candidates is not within Abzena's control. Advancing these candidates into late-stage clinical studies will require significant investment and/or a larger partner, so success of part of the pipeline will depend on the ability of Abzena's licensees to secure the finance and/or partner. This does not include Gilead, Roche, two undisclosed major pharmas and private companies Opsona and Vascular Pharmaceuticals (large pharma investment).

ThioBridge: The growing heart of the matter

Antibody drug conjugates (ADCs) are an emerging class of cancer therapeutics, harnessing the tumour-targeting properties of antibodies with highly potent cytotoxic drugs. The ADC binds to the target antigen on the tumour cell surface and enters the cell, whereupon the payload is released by cleavage of the linker (by acid conditions or enzymes) or when the antibody is degraded in the cell if a non-cleavable linker is used. The released drug then kills the cell (and sometimes adjacent tumour cells) according to the mechanism of action. The payloads now being used in ADCs (tubulin polymerisation inhibitors or DNA-damaging agents) are so potent that they would cause too much damage to healthy cells if used as a standalone chemotherapeutic agent. With both antibodies and cytotoxic drugs often used independently to treat cancer, attaching a toxic payload to a tumour cell selective antibody appears an elegant and highly effective solution.

At the heart of the technology is the linker used to attach the payload to the antibody, which is where Abzena's ThioBridge may offer a number of advantages over the competition. Also, when coupled with Abzena's immunogenicity tools, antibody engineering and manufacturing cell line development, the company has an increasingly strong ADC offering.

A connecting link

The linkers developed by ImmunoGen and Seattle are reactive towards either the amino side chains of lysine residues (in Kadcyla), or to the thiol side chains in cysteine residues, created from reducing inter-chain disulfide bonds (Adcetris). However, both approaches have limitations. Conjugation to lysines, of which there can be more than 80 on a given antibody, cannot be precisely controlled, which leads to a heterogeneous mixture of ADCs with different drug-to-antibody ratios (DAR). Having a consistent DAR of four is suggested by various academic reviews as ideal for an ADC. Too low and naked antibodies compete with ADCs to bind the target, too high and the ADC becomes less stable with a greater chance that the payload is released before reaching the tumour, +causing tolerability issues. Attachment via cysteine residues is an alternative to conjugation to lysines, as there are far fewer cysteine residues in an antibody. An intact IgG1 antibody has four inter-chain disulfide bonds that can be reduced to release eight free cysteine thiols, which can then serve as sites for conjugation. This therefore produces a mixture of ADCs with a still variable DAR ranging from 0-8, while the disulfide bond remains broken after conjugation, which affects the integrity of the antibody, potentially impairing its ability to bind to its tumour cell target.

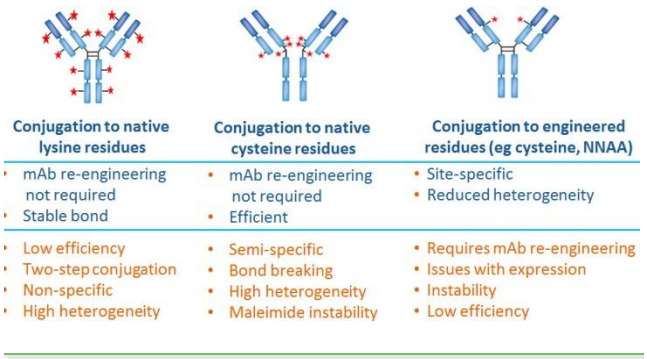
Another method developed to overcome a heterogeneous mixture of ADCs with variable DARs is to use antibodies with engineered cysteine residues, ensuring site-specific conjugation of the payload. This produces a more homogeneous ADC with a DAR of two, although the stability of the linker (maleimide) is still sub-optimal. A further re-engineering approach is to incorporate non-natural amino acids into the antibody as sites for conjugation, which also improves homogeneity while offering flexibility in the number of sites and therefore DAR ranges. However, re-engineering antibodies is complex and therefore may be costly, could introduce stability issues and the final product could be more immunogenic and may therefore attract greater scrutiny from the regulators. Some of the issues with current ADC technologies are summarised and presented in Exhibit 1.

Using native disulfides guarantees 4:1 homogeneity

Abzena's ThioBridge has the potential to address or avoid these issues of instability, heterogeneity and tolerability by targeting native disulfide bonds in an antibody. Using chemistry similar to Abzena's TheraPEG technology used in the attachment of polyethylene glycol to therapeutic proteins (PEGylation), the disulfide bond is reduced and then effectively re-bridged with a reagent including the cytotoxic drug (Exhibit 2). This leaves the antibody structurally intact and does not

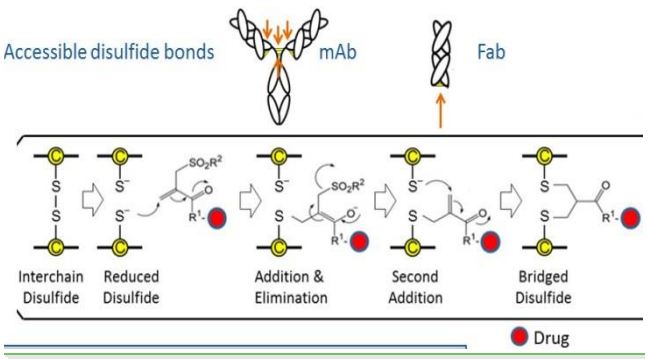
require any engineering. Also, with four accessible, naturally occurring inter-chain disulfides per antibody, a ThioBridge ADC should have a high percentage of DAR 4.

Exhibit 1: Issues with current ADC technologies



Source: Abzena. NNNA = non-natural amino acid

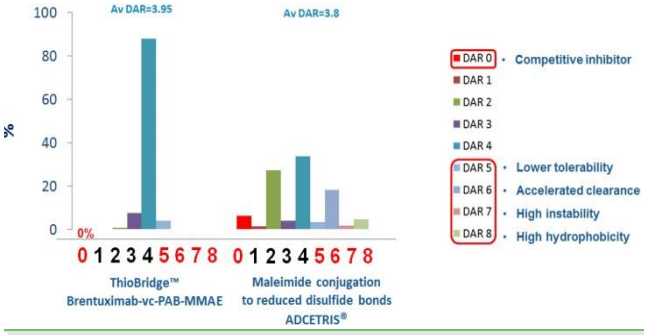
Exhibit 2: ThioBridge conjugation



Source: Abzena

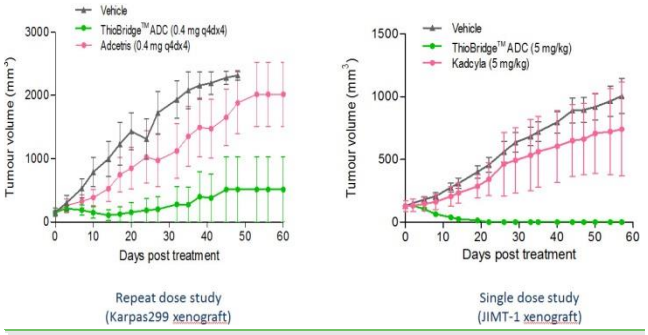
Abzena has conducted a number of assessments using its ThioBridge linker instead of, or compared to, the linker technologies used in Kadcyla and Adcetris. Exhibit 3 demonstrates how ThioBridge improves homogeneity with 80-90% DAR 4 vs Adcetris. Similarly, in *in vivo* cancer models (conducted by Abzena) ThioBridge ADCs have been shown (Exhibit 4) to be more efficacious than Adcetris (Seattle Genetics) and Kadcyla (Immunogen). See below for details of the competitor ADC products.

Exhibit 3: ThioBridge can improve homogeneity



Source: Abzena

Exhibit 4: ThioBridge vs existing ADCs (in vivo)



Source: Abzena

In Exhibit 5 we review the competitive landscape for companies developing ADC technologies. We suggest that the overall profile of ThioBridge (coupled with Abzena's complementary immunogenicity/antibody engineering/cell line manufacturing) offers a compelling case for partners to seek out Abzena for the development of a new generation of ADC products.

Exhibit 5: ADC linker technologies

Company	Linker	Payload release mechanism	DAR average	Mixture	Candidate status
Seattle Genetics	Dipeptide: valine-citrulline	Cleavable (cathepsin B)	4:1	Heterogenous	Marketed: Adcetris
	Maleimidocaproyl (mc) moiety	Non-cleavable (Ab degradation in lysosome)	Unknown	Heterogenous	Phase II: ABT-414
ImmunoGen	SMCC (thioether linker)	Non-cleavable (Ab degradation in lysosome)	3.5:1	Heterogenous	Marketed: Kadcyla
Immunomedics	Carbonate (CLA2A)	Cleavable (pH-sensitive)	7.6:1	Heterogenous	Phase II: IMMU-130, IMMU-132
Abzena	ThioBridge (site-specific conjugation via disulfide bridging)	Cleavable or non-cleavable options	4:1	Homogenous	Preclinical
Ambrx	Not specified (Ab involves engineering with non-native amino acids)	Cleavable	2:1	Homogenous	Preclinical
Antikor	OptiLink (lysine residue-based)	Cleavable	10-12:1	Heterogenous	Preclinical
Igenica	SNAP bifunctional linkers (site-specific conjugation via disulfide bridging)	Cleavable or non-cleavable options	4:1	Homogenous	Preclinical
Meditope Biosciences	Meditope (Fab region binding)	Cleavable	2:1	Homogenous	Preclinical
Mersana Therapeutics	Customisable linker chemistries (Fleximer payload platform)	Cleavable or non-cleavable options	20-30:1	Heterogenous	Preclinical
Sutro Biopharma	Not specified (Ab involves engineering with non-native amino acids)	Cleavable	Multiple	Homogenous	Preclinical
ThioLogics	Thiomaleamate–PABC	Cleavable	Unknown	Homogenous	Preclinical

Source: Edison Investment Research

Abzena ThioBridge deals to date

Abzena has now successfully concluded two significant partnering ThioBridge deals. Furthermore, according to the company, other companies are evaluating or have options to utilise the technology. In our opinion, Abzena is well placed to benefit from this developing field in the future.

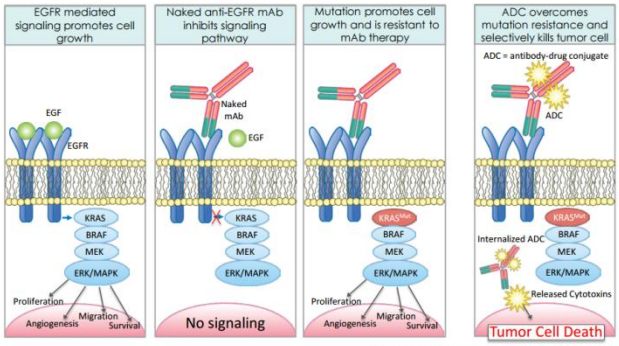
Halozyme ADC deal

In January 2016, Abzena signed a significant licensing deal with Halozyme Therapeutics, a listed US biotech company that is developing and commercialising oncology therapies, including biological agents. The deal established rights to the ThioBridge technology for three targets. It included an initial licence fee and the potential to receive up to $150m ($50m per ADC product assumed) in development/commercial milestones if Halozyme successfully develops each of three ADC products. To date, the research collaboration with Halozyme has screened multiple ADC candidates and one has been selected for further development. We anticipate that the first ADC product will enter the clinic in FY19.

Halozyme is developing tumour microenvironment therapeutics, specifically an anti-EGFR (epidermal growth factor receptor) therapeutic, for which it is using ThioBridge. Current anti-EGFR therapies have two limitations associated with them: 1) a dose-limiting skin rash, which in some patients can be severe enough that they are unable to receive the drug; and 2) downstream activating mutations such as KRAS, BRAF or EGFR itself. Halozyme's ADC is designed to mitigate these limitations.

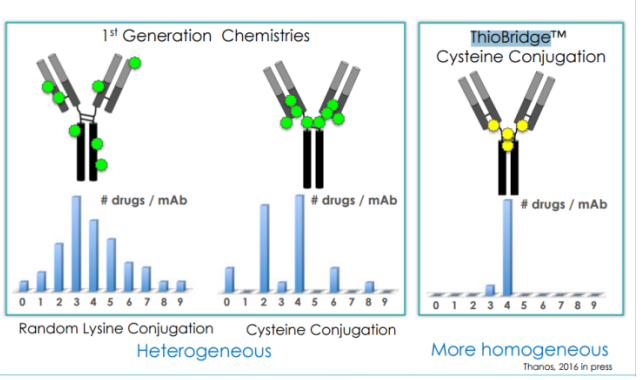
EGFR mediates signalling in tumour cells and promotes cell growth. Halozyme has developed an antibody, which it believes can bind to the EGFR receptor in the tumour microenvironment with high affinity (low affinity to receptors within the skin, thereby potentially reducing the skin reaction limitation) and inhibit the signalling pathway thereby preventing proliferation, angiogenesis etc. However, in some cases there is a mutation in the signalling pathway (eg KRAS), which makes the cell resistant to mAb therapy. The hypothesis is that an ADC can overcome this mutation resistance and selectively kill the tumour cell, ie it is internalised and bypasses the mutation. Exhibit 6 outlines the proposed mechanism.

Exhibit 6: Process ADCs may treat EGFR+ mutation-resistant Tumors



Source: Halozyme presentation

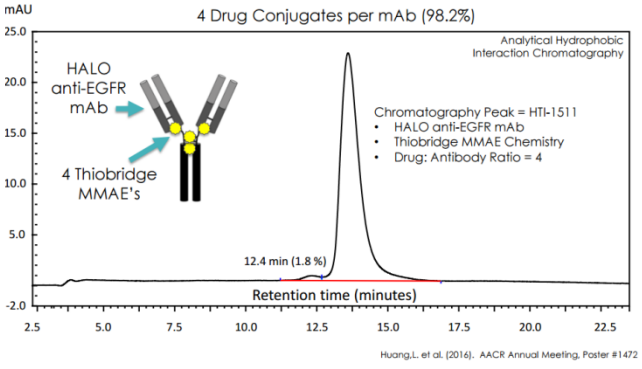
Exhibit 7: ThioBridge next generation ADC technology



Source: Halozyme presentation

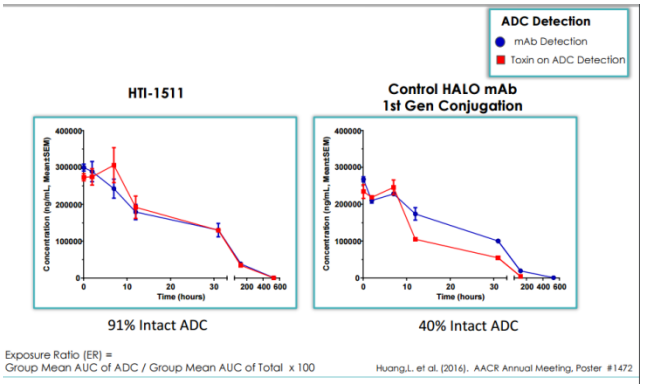
Halozyme has been clear about its choice of using Abzena's ADC ThioBridge as, in its view, it offers the 'next-generation' ADC technology (see Exhibit 7) with highly specific four drugs per mAb and a more stable chemistry. Exhibits 8 and 9 delineate data that underpin this view, demonstrating Halozyme's drug conjugate HTI-1511 (Anti-EGFR mAb conjugated with ThioBridge-MMAE [monomethyl auristatin E]) as highly homogenous and with improved stability over time respectively.

Exhibit 8: Anti-EGFR mAb conjugated with ThioBridge-MMAE homogeneity data



Source: Halozyme presentation

Exhibit 9: Improved ADC stability



Source: Halozyme presentation

Halozyme has presented promising data in terms of tumour regressions in KRAS- and BRAF-mutated tumour models and in patient-derived tumour models in mice. For an overview click here.

San Diego-based biopharmaceutical company deal

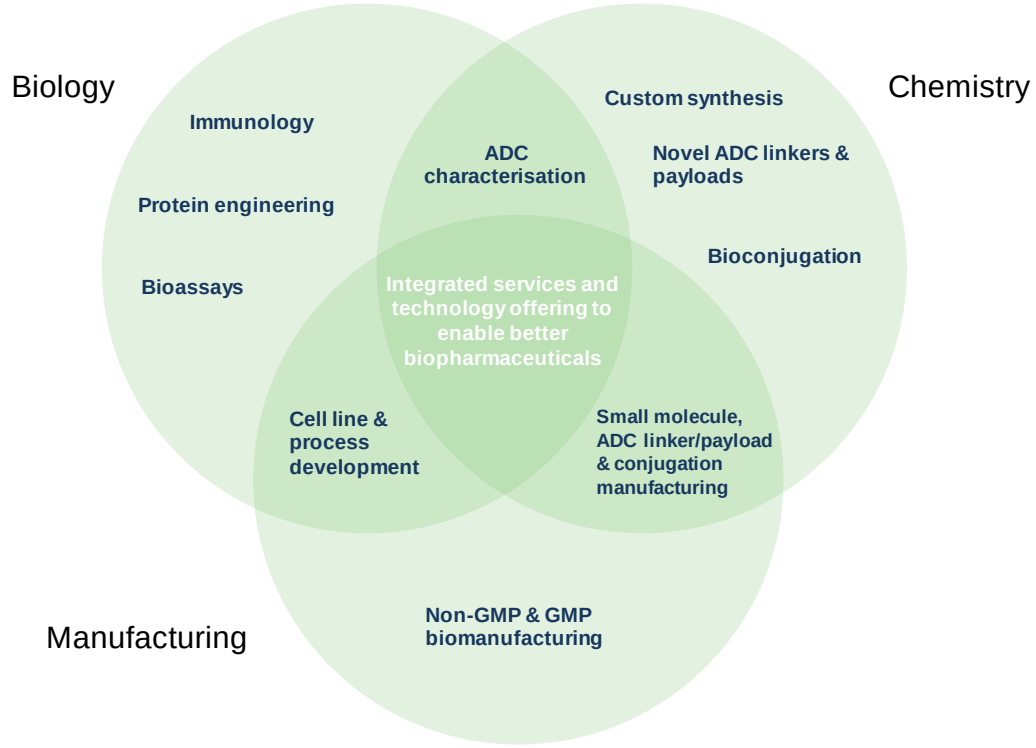
Abzena's most recent significant ThioBridge deal was announced in January 2017. It indicated that it had signed a significant licensing agreement with a San Diego-based biopharmaceutical company for its novel site-specific ThioBridge technology and a master services agreement to use its chemistry services. The licensing deal includes the use of ThioBridge in up to 10 ADCs across a wide range of indications. According to the company, the value of the agreement has the potential to reach more than $300m in development/commercial milestones if the partner successfully develops the ADC products. Alongside this, Abzena would also receive royalties on sales of any approved products that incorporate the ThioBridge technology.

This deal is significant not just because we expect Abzena to gain greater deal economics from its ADC products due to the greater technological and IP input resulting from ThioBridge (vs Abzena's licensed portfolio of antibodies developed using its Composite Human Antibody technologies, which offers the prospect of small royalties (~1%) on sales), but also due to the inclusion of a master

services agreement. The agreement means that Abzena will undertake the chemistry work for the San Diego biopharmaceutical company generating revenue for its services business. This provides strong validation of Abzena's hybrid business model, an integrated service and technology offering (See Exhibit 10), which enables:

1. offering a continuum of services from antibody discovery to GMP manufacture for Phase I and II clinical trials; and
2. retaining upside from its expanding clinical pipeline (in which Abzena's technology has been utilised, which is developed and fully funded by global partners (termed Abzena *inside* products). For a full overview of the other Abzena inside products, see our previous Abzena notes.

Exhibit 10: Integrated services and technology

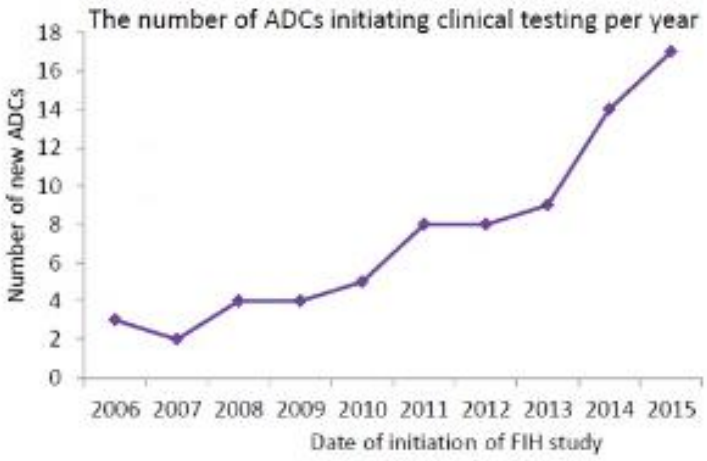


Source: Abzena

ADC drug development

The development of ADCs has proved challenging, but this is typical of novel drug development, as demonstrated by the long and arduous route to successful development of antibodies, which now accounts for five of the top 10 biggest selling drugs globally. Despite the challenges, there are, according to Beacon ADC, c 59 active clinical trials currently focused on ADCs that have antibodies linked to a cytotoxic payload. While there remain only two marketed ADCs, the clinical pipeline is growing with the number of ADC trials initiating growing substantially (see Exhibit 11) and there are now four ADCs in Phase III (see Exhibit 12).

Exhibit 11: Number of ADCs initiating clinical testing per year



Source: World ADC seminars, Beacon ADC

The first ADC to reach the market was Mylotarg (gemtzumab ozogamicin) in 2000, for the treatment of acute myeloid leukaemia (AML), but the product was withdrawn in 2010 following safety concerns and lack of efficacy. However, two more recent ADC product launches have been far more successful: Seattle Genetics' Adcetris (brentuximab vedotin) approved in 2011 to treat Hodgkin's lymphoma and anaplastic large cell lymphoma ($450m sales in FY15) and Roche's Kadcyla (trastuzumab emtansine) approved in 2013 for HER2+ve breast cancer ($843m sales in FY16). Kadcyla was developed using ImmunoGen's ADC technology. Seattle Genetics and ImmunoGen remain the dominant players in the field, in terms of these approved products and the mid- to late-stage pipeline of ADC candidates (Exhibit 12). For an overview of the difference between Immunogen's and Seattle Genetics' ADC technology, please see above.

Exhibit 12: ADC portfolio – marketed and late-stage pipeline (at least Phase II*)

Product	Company	ADC licensor	Antibody target	Payload	Status	Indication
Adcetris (brentuximab vedotin)*	Seattle Genetics		CD30	Auristatin (MMAE)	Marketed	2011: FDA accelerated approval for Hodgkin's lymphoma and anaplastic large cell lymphoma; $450m sales in FY15; Multiple Phase III studies ongoing for CTCL, PTCL and NHL.
Kadcyla (trastuzumab emtansine, T-DM1)**	Roche	ImmunoGen	HER2	Maytansine (DM1)	Marketed	Feb 2013: FDA approval for HER2+ve metastatic breast cancer; $843m sales in FY16; Phase II/III studies ongoing for gastric cancer + NSCLC.
Sacituzumab govitecan (IMMU-132)	Immunomedics		TROP2	SN-38 (irinotecan metabolite)	Phase III	Triple-negative breast cancer (TNBC); SCLC; pancreatic cancer; colorectal cancer
Mirvetuximab soravtansine (IMGN853)	Immunogen		FRα	DM4	Phase III	Women with platinum-resistant FR-alpha positive advanced EOC, primary peritoneal cancer and/or fallopian tube cancer.
Vadastuximab talirine (SGN-CD33A)	Seattle Genetics		CD33	Pyrrolobenzo-diazepine (PBD) dimer	Phase III	Acute Myeloid Leukaemia
Inotuzumab ozogamicin	Pfizer	UCB Pharma	CD22	Calicheamicin	Phase III	Relapsed or refractory CD22-positive acute lymphoblastic leukemia
Polatuzumab vedotin (RG7596)	Roche	Seattle Genetics	CD79b	Auristatin (MMAE)	Phase II	NHL; diffuse large B-cell lymphoma
SAR3419	Sanofi	ImmunoGen	CD19	Maytansine (DM4)	Phase II	NHL (DLBCL); B-cell ALL
ABT-414	AbbVie	Seattle Genetics	EGFR	Auristatin (MMAF)	Phase II	Glioblastoma multiforme; squamous cell tumours
Glembatumumab vedotin (CDX-011)	Celldex Therapeutics	Seattle Genetics	GPNMB	Auristatin (MMAE)	Phase II	Breast cancer; advanced melanoma
PSMA ADC	Progenics Pharmaceuticals	Seattle Genetics	PSMA	Auristatin (MMAE)	Phase II	Prostate cancer (metastatic castration-resistant, CRPC)
Labetuzumab-SN-38 (IMMU-130)	Immunomedics		CEACAM5	SN-38 (irinotecan metabolite)	Phase II	Metastatic colorectal cancer
Sacituzumab govitecan (IMMU-132)	Immunomedics		TROP-2	SN-38 (irinotecan metabolite)	Phase II	Triple-negative breast cancer (TNBC); SCLC; pancreatic cancer; colorectal cancer

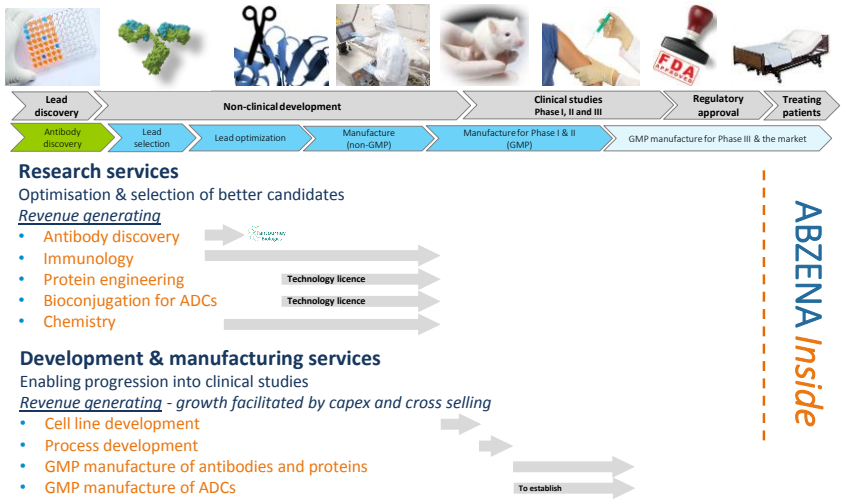
Source: Edison Investment Research, BioCentury, clinicaltrials.gov. Note: *Not an exhaustive list of Phase II trials. **Regarded as first-generation ADC products, with stability and heterogeneity issues that may limit their effectiveness and increase unwanted side effects.

Services business: Strong underpinning

Abzena offers a continuum of services from antibody discovery to GMP manufacture for Phase I and II clinical trials and is building on this by investing in further capacity and growing its customer base, including cross-selling across the expanded group. Importantly, the company has an increasingly strong presence in the US, a significant market in the biopharmaceutical industry, as it now has a significant operating footprint and the majority of its business is from US companies. Exhibit 13 provides an overview of the services and technologies Abzena can offer.

Abzena had a solid start to FY17, with H117 revenue increasing by 156% to £9.0m (H116 £3.5m), which represents 46% growth on an underlying basis. While the recent ThioBridge deal has not made an impact on our near-term forecast services business revenue, the inclusion of the use of Abzena's chemistry services in the deal underpins our forecasts and provides comfort that they will be met. For a more detailed overview of Abzena's services and technologies, see our outlook note published on 21 June 2016.

Exhibit 13: Abzena's services and technologies



Source: Abzena

Sensitivities

With stable and growing revenues from its services business and a licensed portfolio of drugs that does not require R&D spend, Abzena operates a relatively low-risk business model. However, the biological services industry is highly competitive and will require Abzena to continually invest in enhancing its technologies and offering to the sector. This may include the need to acquire new assets/companies, which adds an element of execution risk, but with shrewd selection of targets this should only help strengthen Abzena's position and therefore the investment case. Abzena acquired two manufacturing businesses at the end of 2015 to expand its offering, which it is integrating and embedding into the broader offering. Although the potential future revenue streams from royalties on sales of products developed using Abzena's technologies appear to offer pure upside, the development of these candidates is not within Abzena's control. With the exception of Gilead, Roche, two undisclosed major pharmas and private companies Opsona and Vascular Pharmaceuticals (a large pharma investment), a number of candidates are being developed by relatively small private companies that may struggle to secure the finance required to develop their products in a timely and effective manner. Advancing these candidates into late-stage clinical studies will require significant investment and/or a larger partner, so success will depend on the ability of Abzena's smaller licensees to secure the finance/partner.

Valuation

We have adjusted our fair value to £117m (from £112m) or 85p per share (vs 82p) to include the recent ThioBridge licensing agreement with a San Diego-based biopharmaceutical company, a review of the ADC deal metrics and updated the number of shares. Exhibit 14 outlines our updated valuation (no change to the services business valuation) metrics and key assumptions.

Exhibit 14: Abzena valuation model and key assumptions

	rNPV (£m)	rNPV per share (p)	Key assumptions
Services business	48.1	34.9	Three-phase DCF: 2017-20 (6-10% growth), 2021-25 (2-5% growth), 2% TV on 2025 FCF (steady-state); 10% WACC; 12-15% effective tax rate; 60% COGS; 60% of group admin expense.
Licensed biological product royalties	59.4	43.4	Risked-adjusted royalties (1-5%) on partner's product sales; 12.5% WACC; 12% effective tax rate; 50% of group R&D expense (risk-adjusted); no milestones included.
Portfolio subtotal	107	78	
Cash (H117)	9.4	6.8	H117 (30 Sept 2016).
Overall valuation	117	85	137.8m shares outstanding (basic).

Source: Edison Investment Research

We have updated our model to include the recent licensing deal, which includes the use of ThioBridge in up to 10 ADCs across a wide range of indications. According to the company, the value of the agreement has the potential to reach more than $300m in development/commercial milestones if the partner successfully develops the ADC products. Alongside this, Abzena would also receive royalties on sales of any approved products that incorporate the ThioBridge technology. As with the previous deal announced by Abzena with regard to ThioBridge (with Halozyme in 2016), we expect Abzena to gain greater deal economics from its ADC products due to the greater technological and IP input resulting from ThioBridge. We have included 10 ADC products in our model, with two products reaching the clinic every year starting in FY18. We also include peak sales of $500m (potentially a conservative assumption in the absence of further information and based on the lower end of peak sales assumptions for other Abzena *inside* products) and $30m in development/licence fees. We have also reviewed the Halozyme ThioBridge metrics in the model, updated the peak sales to $500m (vs $1bn) and moved timing to the clinic to FY19 to be conservative and in line with the recent deal. Finally, we have updated the number of shares to 137.8m following the announcement that Abzena was adding to its ordinary shares following the completion of the initial vesting period of restricted stock units to employees on the acquisition of the Chemical Research Solution in 2015.

We value the licensed product portfolio at £59m, which includes Abzena's licensed portfolio of antibodies developed using its Composite Human Antibody technologies. Please note that we now only include those that are in clinical development. Exhibit 14 outlines our assumptions.

Exhibit 15: Valuation assumptions by product

	Product – partner	Status	Peak sales ($m)	Probability of success	Launch date	Estimated royalty rate
1	GS-5745 - Gilead Sciences	Phase III	2,500	50%	2019	1%
2	OPN-305 - Opsona Therapeutics	Phase II	750	35%	2020	1%
3	VPI-2690B - Vascular Pharmaceuticals	Phase II	1,000	35%	2021	1%
4	NKT120 - NKT Therapeutics	Phase Ib	250	25%	2021	1%
5	RG6125 Roche (formerly known as SDP051)**	Phase II	1,000	25%	2023	1%
6	TBI 304H - Therapure Innovations	Phase I	1,000	15%	2021	1%
7	US major pharma partner	Phase I	1,000	15%	2022	1%
8	US Pharma	Phase I	750	15%	2022	1%
9	US Biotech	Phase I	750	15%	2022	1%
10	US Biotech	Phase I	750	15%	2023	1%
11	Private US Biotech	Phase I	750	15%	2023	1%
12	Halozyme ADC Product 1	Preclinical	500	5%	2026	3%
13	Halozyme ADC Product 2	Preclinical	500	5%	2027	3%
14	Halozyme ADC Product 3	Preclinical	500	5%	2028	3%
15	US Biotech ADC Product 1 and 2	Preclinical	1,000*	5%	2025	3%
16	US Biotech ADC Product 3 and 4	Preclinical	1,000*	5%	2026	3%
17	US Biotech ADC Product 5 and 6	Preclinical	1,000*	5%	2027	3%
18	US Biotech ADC Product 7 and 8	Preclinical	1,000*	5%	2028	3%
19	US Biotech ADC Product 9 and 10	Preclinical	1,000*	5%	2029	3%

Source: Edison Investment Research. Note: *For both products. **Roche bought Adheron Therapeutics.

The recent ThioBridge agreement further validates Abzena's technology and hybrid business model as the deal includes licence/development fees and royalties, as well as making use of its chemistry services. For a more detailed discussion of the hybrid business model see our outlook note published on 21 June 2016.

In our opinion, the outlook is positive for Abzena. There appears to be a growing interest and investment in ADCs and, as outlined above, ThioBridge offers a number of benefits over some of the current competitors. This could lead to an expanded use of its ThioBridge technology. In addition, we note that four of the Abzena *inside* products are being developed by four leading biopharmaceutical companies: Gilead, Roche and two undisclosed. This is a strong endorsement of Abzena's Composite Human Antibody technologies platform and expertise in the field. This could lead to a number of inflection points as the company continues to grow and progress towards royalties from its Abzena *inside* products. Potential newsflow that would provide uplift to the valuation includes progression of Gilead Sciences GS-5745 in various indications (futility analysis expected for its Phase III study in Gastric cancer inQ317) and Roche's RG6125 (formerly known as SDP051), which is Phase IIa ready.

Financials

We have not altered our key forecasts, maintaining revenue at £19.1m for FY17 and £25.0m in FY18 and PBT loss of £8.2m and £5.7m in FY17 and FY18 respectively. While the recent ThioBridge deal has not made an impact on our forecasts, the inclusion of the use of Abzena's chemistry services in the deal provides comfort that they will be met. H117 reported cash was £9.4m, which we currently forecast will reach into FY18. We expect a financing requirement in that year. For illustrative purposes, we have included a loan financing of £10m in FY18 and updated the number of shares (137.8m) following the announcement of the completion of the initial vesting period of restricted stock units to employees on the acquisition of the Chemical Research Solution in 2015. We also expect capex to increase (FY17 £4m vs FY16 £2m), as the company invests in expanding its GMP manufacturing capacity in San Diego and chemistry services in Bristol (US).

Exhibit 16: Financial summary

£'000s	2014	2015	2016	2017e	2018e
Year end 31 March	IFRS	IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS					
Revenue	5,261	5,667	9,854	19,076	25,008
of which: Biology	3,128	4,158	5,299	6,422.5	8,237
Manufacturing	419	594	2,096	5,658.0	9,006
Chemistry	165	657	2,174	6,395.2	7,015
Total Service revenues	3,712	5,409	9,569	18,476	24,258
Licenses/milestones/royalties	1,549	258	285	600	750
Cost of Sales	(1,697)	(2,532)	(5,319)	(11,233)	(13,342)
Gross Profit	3,564	3,135	4,535	7,842	11,666
R&D expenses	(2,601)	(2,989)	(4,216)	(3,794)	(3,984)
SG&A expenses	(4,787)	(5,634)	(9,047)	(13,118)	(14,102)
EBITDA	(3,116)	(4,510)	(6,972)	(6,780)	(4,312)
Operating Profit (before GW and except)	(3,394)	(4,795)	(7,773)	(8,240)	(5,654)
Intangible Amortisation	(304)	(504)	(588)	(731)	(666)
Depreciation	(278)	(285)	(801)	(1,460)	(1,342)
Exceptionals	(426)	0	(2,542)	0	0
Operating Profit	(4,124)	(5,299)	(10,903)	(8,970)	(6,320)
Other	0	0	0	0	0
Net Interest	27	79	244	50	1
Profit Before Tax (norm)	(3,367)	(4,716)	(7,529)	(8,190)	(5,652)
Profit Before Tax (FRS 3)	(4,097)	(5,220)	(10,659)	(8,920)	(6,319)
Tax	548	498	961	1,070	758
Profit After Tax (norm)	(2,819)	(4,218)	(6,568)	(7,119)	(4,894)
Profit After Tax (FRS 3)	(3,549)	(4,722)	(9,698)	(7,850)	(5,560)
Average Number of Shares Outstanding (m)	1.4	71.6	109.4	137.8	137.8
EPS - normalised (p)	N/A	(5.89)	(6.00)	(5.16)	(3.55)
EPS - FRS 3 (p)	N/A	(6.59)	(8.86)	(5.69)	(4.03)
Dividend per share (p)	0.0	0.0	0.0	0.0	0.0
BALANCE SHEET					
Fixed Assets	10,139	10,432	27,347	29,171	29,678
Intangible Assets	9,446	8,942	23,177	22,461	21,809
Tangible Assets	693	1,490	4,170	6,711	7,868
Other	0	0	0	0	0
Current Assets	5,856	20,924	22,108	11,984	16,078
Stocks	295	817	1,379	1,379	1,379
Debtors	2,263	3,161	5,436	5,436	5,436
Cash	2,757	15,799	13,724	4,098	8,505
Other	541	1,147	1,569	1,070	758
Current Liabilities	(1,278)	(2,354)	(5,850)	(5,850)	(5,850)
Creditors	(1,160)	(2,354)	(5,488)	(5,488)	(5,488)
Short term borrowings	0	0	0	0	0
Short term leases	0	0	0	0	0
Other	(118)	0	(362)	(362)	(362)
Long Term Liabilities	(1,183)	(1,153)	(2,549)	(2,549)	(12,549)
Long term borrowings	0	0	0	0	(10,000)
Long term leases	0	0	0	0	0
Other long term liabilities	(1,183)	(1,153)	(2,549)	(2,549)	(2,549)
Net Assets	13,534	27,849	41,056	32,756	27,357
CASH FLOW					
Operating Cash Flow	(4,328)	(4,859)	(10,870)	(6,661)	(4,190)
Net Interest	0	0	0	0	0
Tax	251	(133)	371	961	1,070
Capex	(264)	(1,082)	(2,047)	(4,014)	(2,515)
Acquisitions/disposals	(6,133)	0	(9,357)	0	0
Financing	10,670	19,037	20,013	0	0
Dividends	0	0	0	0	0
Other	(6)	79	(185)	89	40
Net Cash Flow	190	13,042	(2,075)	(9,626)	(5,593)
Opening net debt/(cash)	(2,754)	(2,757)	(15,799)	(13,724)	(4,098)
HP finance leases initiated	0	0	0	0	0
Other	(187)	0	0	0	0
Closing net debt/(cash)	(2,757)	(15,799)	(13,724)	(4,098)	1,495

Source: Abzena accounts, Edison Investment Research

Contact details	Revenue by geography FY16
Babraham Research Campus Babraham Cambridge CB22 3AT UK +44 (0)1223 903 498 www.abzena.com	

Management team

Chief Executive Officer: John Burt	Chief Financial Officer: Julian Smith
Joined PolyTherics in November 2010, initially as chief business officer then becoming CEO in May 2011. Following the acquisition of Antitope and creation of Abzena, John is CEO of the group. Co-founder and CEO of Thiakis (2004-08, when Thiakis was acquired by Wyeth). Previous roles include finance, technology licensing and business and corporate development responsibilities at Vanguard Medica, GlaxoSmithKline and Imperial Innovations.	Joined PolyTherics as CFO in September 2013, now CFO for the group. Julian was chief financial and operations officer at Imperial Innovations (2006-13). Prior to Imperial Innovations, he was CFO of RadioScape and group financial controller of Mobile Systems International.
President, Abzena US: John Manzello	**Chief Business Officer: Sven Lee**
Joined Abzena in October 2016 after serving as president of San Diego's Promosome, where he joined the company as president & CEO in April 2007. John expanded the business development, IP portfolio and strategic alliances for the company's suite of synthetic biology technologies. Before joining Promosome, he held business and commercial development roles at Althea Technologies, Cohesive Technologies, Genzyme Transgenics (GTC) and GTC's CRO/CMO subsidiary Primedica.	Before joining Abzena, Sven was director of global sales and business development for the cell therapy technologies business unit of Terumo BCT. Before Terumo, he was VP of global business development at Catalent Biologics, responsible for the team's preclinical through Phase I/II GMP manufacturing business. He also launched the SMART Tag antibody drug conjugation platform. Before Catalent, Sven spent five years as director of business development with Crucell (Johnson & Johnson) and 10 years with Biogen.
Senior VP Scientific Operations: Campbell Bunce, PhD	**Senior VP Technical Operations: Jim Mills, PhD**
Campbell has over 19 years 'experience working in the biotech and diagnostics sectors, occupying senior management positions with Piramed Pharma (director, development programmes), Immune Targeting Systems (R&D director) and Oxford Immunotec (GM, immunology products). He has extensive experience in developing novel biologics and vaccines for cancer, inflammatory and infectious diseases, leading them through development and regulatory processes.	Jim joined Abzena's executive team in March 2015 as VP of technical operations. He was previously CEO of Cantab Biopharmaceuticals, having originally joined the company in 1997 as part of the process development group. Jim has a background in protein production and GMP manufacturing, having obtained his PhD in microbial physiology and biochemistry from the University of Leicester.

Principal shareholders	(%)
Invesco Asset Management	26.2
Woodford Investment Management LLP	22.9
Touchstone Innovations	19.7
Ballie Gifford & Co	3.3

Companies named in this report

Seattle Genetics (SGEN), ImmunoGen (IMGN), Immunomedics (IMMU), Celldex Therapeutics (CLDX), Roche (ROG), Gilead Sciences (GILD), Opsona Therapeutics, Vascular Pharmaceuticals, NKT Therapeutics, Adheron Therapeutics, Therapix Biosciences, Annexon Biosciences, Therapure Innovations

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