hardman&co

Redx Pharma

Strategy launch

Redx Pharma's (REDX) new management team is continuing to focus its financial resources on progressing lead candidates in oncology and fibrotic disease into the clinic. An extensive internal review, led by the new CEO Lisa Anson has reinforced the vision of a streamlined pipeline in these two disease areas, with the aim of progressing drug candidates to deliver clinical proof-of-concept, a key value inflection point. 2019 is expected to be a busy year for REDX, with several major milestones due. The first of these will be the re-start of the Phase I/II trial with RXC004, its porcupine inhibitor, during 1H'19.

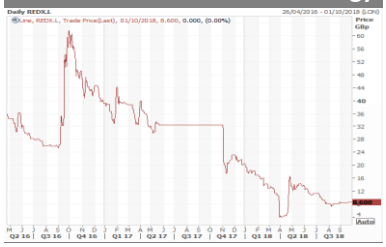
- **Strategy:** REDX is focused on the discovery and early clinical development of small molecule therapeutics in oncology and fibrotic disease. It aims to take assets through proof-of-concept clinical trials and potentially forge partnerships for later-stage development and unlock additional shareholder value.
- **Pipeline:** REDX has a clear vison, a streamlined pipeline focused on high unmet needs in oncology and fibrotic diseases, and also aims to leverage its medicinal chemistry expertise. The company has ambitions to progress first-in-class or best-in-class compounds in biologically validated targets.
- **Milestones:** Management has set some ambitious, but achievable, goals. 2019 will be an important year with the re-start of the Phase I/IIa trial with RXC004. It also aims to nominate one to two development candidates from a portfolio of three fibrosis programmes, with first clinical trials in 2020.
- **Risks:** After a difficult period, REDX has emerged in much better shape. While all early-stage pharma/biotech companies carry substantial risks and are capital-intensive, the rewards can be substantial, as evidenced by the successful disposal of its BTK programme for $40m (£30.5m net) in cash in 2017.
- **Investment summary:** The strengthened management team is moving forward with a revised business plan that focuses cash resources on progressing its drug leads in oncology and fibrotic disease to clinical proof-of-concept. Big pharma is known to be willing to pay substantial prices for novel and/or de-risked assets with clinical data, reinforcing REDX's strategy and offering the potential to generate significant shareholder value for companies such as Redx Pharma.

Financial summary and valuation

Year-end Sep (£000)	2015	2016	2017	2018E	2019E	2020E
Other income	2,648	2,380	1,291	1,000	1,000	1,000
R&D investment	-9,463	-14,315	-13,000	-6,528	-11,078	-11,410
SG&A (corp. cost)	-2,008	-2,212	-5,698	-3,150	-3,276	-3,407
Underlying EBIT	-8,823	-14,147	-17,407	-8,678	-13,354	-13,817
Underlying PBT	-9,112	-14,606	-17,737	-8,648	-13,327	-13,817
Statutory PBT	-8,825	-15,407	1,646	-9,240	-13,547	-14,057
R&D tax credit	650	637	-118	392	665	685
Underlying EPS (p)	-14.6	-17.8	-15.8	-6.5	-8.8	-8.2
Statutory EPS (p)	-14.1	-19.8	1.4	-7.0	-9.0	-8.4
Disposals	0	0	30,474	0	0	0
Net (debt)/cash	7,436	3,758	23,806	5,595	2,718	-10,382
Capital increases	13,447	9,296	11,066	0	10,000	0

Source: Hardman & Co Life Sciences Research

Pharmaceuticals & Biotechnology



Source: Eikon Thomson Reuters

Market data

EPIC/TKR	**REDX**
Price (p)	8.6
12m High (p)	28.6
12m Low (p)	3.5
Shares (m)	126.5
Mkt Cap (£m)	10.9
EV (£m)	5.3
Free Float*	69%
Market	AIM

**As defined by AIM Rule 26*

Description

Redx is focused on the discovery and development of proprietary, small molecule therapeutics to address areas of high unmet medical need, in cancer and fibrosis. The aim is to develop putative drugs through early trials and then to partner them for late stage development and commercialisation.

Company information

CEO	Lisa Anson
CFO	Dominic Jackson
Chairman	Iain Ross
	+44 1625 469 900
	www.redxpharma.com

Key shareholders

Directors	0.5%
Jon Moulton	18.2%
Seneca Partners	12.5%
AXA	9.8%
Aviva	8.4%
Paul & Thelka Blackmore	4.0%

Diary

Dec'18	Full year Results
1H'19	Resume Ph. I with RXC004

Analysts

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Operational update

New focus strategy

Vision

REDX has the vision "*to become a leading biotech business focused on the development of novel medicines that have the potential to transform the treatment of oncology and fibrotic diseases*". This goal will be supported by a management team with strong scientific and commercial experience.

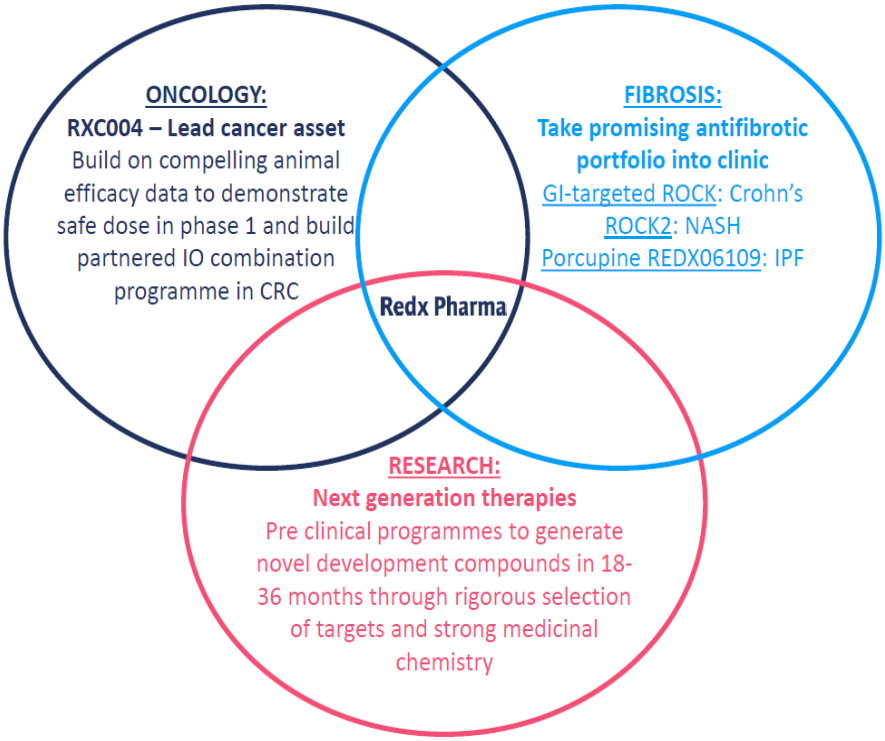
Strategy

REDX's pipeline focus on two major disease areas in oncology and fibrosis

Following the appointment of Lisa Anson as Chief Executive Officer, the management team has undertaken an extensive internal review. It has emerged with a more focused vision and streamlined pipeline with innovative products in two major disease areas with high unmet medical need:

- **Oncology:** with the porcupine inhibitor as lead programme in Phase I/IIa clinical trials.
- **Fibrosis:** with three programmes in late research approaching pre-clinical development and aiming to reach a stage when regulatory applications can be made for the initiation of clinical trials.

Three inter-related investment pillars



Source : Redx Investor presentation 2018

- **Progress programmes to deliver clinical proof-of-concept data:** The Phase I/IIa with RXC004 is expected to resume in 1H'19. Also, either one or two of the three programmes in fibrosis are expected to enter the pre-clinical development stage within 12 months.

- **Leverage its medicinal chemistry expertise:** REDX has maintained a strong medicinal chemistry group with expertise in progressing assets towards the clinic as exemplified by the porcupine inhibitor RXC004 and also the BTK programme that was divested successfully to US-based Loxo Oncology for $40m (£30.5m net) in July 2017. This presents a strong track record in REDX's medicinal chemistry team in rigorously identifying biologically attractive targets, which are then internally developed into commercially attractive assets.
- **Partnering:** at the clinical or pre-clinical stage, when appropriate, to enable additional development and increase shareholder value.

Asset development

REDX received the agreement in principle from the MHRA to re-start the Phase I/IIa with RXC004 in 1H'19

In February 2018, REDX achieved an important milestone with the initiation of its first clinical study, which is investigating RXC004 in advanced cancer patients with solid tumours, as a single agent, in a Phase I/IIa trial. However, on 29 March, REDX decided to temporarily stop patient recruitment because the first subject had experienced some adverse events that could be anticipated with Wingless-type (Wnt) inhibition, but at much higher doses than that used in the trial. Following a full assessment and discussions with the regulator, REDX has agreement in principle from the MHRA to re-start the trial in 1H'19 with a modified protocol using lower doses.

There is a strong rationale, from both pre-clinical and clinical studies, that Wnt pathway activity drives the immune evasion of tumours. Porcupine inhibition has the potential to block critical mechanisms of tumour cell immune evasion. High β-catenin protein levels seen in high Wnt pathway activation were recently reported to correlate with lack of immune signature across 22 different cancer types. In addition, the lack of immune signature has been linked to a lack of response to immune checkpoint inhibitors (such as anti-PD-1). In that respect, REDX has demonstrated efficacy by an immune system mechanism with RXC004 in combination with an anti-PD-1 antibody in a pre-clinical colorectal tumour model. Furthermore, RXC004 has demonstrated monotherapy immune effects in a pre-clinical melanoma model.

The fibrotic portfolio comprises of three distinct programmes

For fibrotic diseases, REDX has the ambition to bring one or two candidates from its promising portfolio of three assets to the development candidate stage in 2019 for three commercially attractive indications:

- **Porcupine inhibitor (REDX06109):** The fibrosis programme for idiopathic pulmonary fibrosis (IPF) is to enter pre-clinical development in 1H'19 and the first-in-man clinic in 2H'20. IPF is a fatal disease with no effective therapy to date. It is estimated that 123,000 patients had diagnosed IPF in 2017 (US, 5EU and Japan) and that 25,000 people die from the disease in the US each year. Two treatment options, Esbriet and Ofev, are currently available, which slow the progression of the disease, but they also have significant side effects. Both tend to be used in patients with mild and moderate disease, meaning that there is an opportunity for REDX to develop REDX06109 in patients with moderate to severe disease.
- **GI-targeted ROCK inhibitor:** Lead asset is first-in-class targeting Crohn's related fibrosis and expected to enter pre-clinical development in 1H'19 and into clinical trials by 2H'20. 1.5m people in the US, EU and Japan have Crohn's disease and 50% of them will develop strictures and complications.
- **ROCK2 selective:** Pre-clinical development is expected in 2H'19 in non-alcoholic steatohepatitis (NASH) and the clinic in 2H'20. As yet, no drug has been approved and R&D activity to find a treatment for NASH is crowded, with an estimated 158 companies investigating 195 pipeline products.

Within this space, REDX is one of few companies focusing on the fibrotic component of the disease, rather than anti-inflammatory or anti-lipids effects. Fibrosis increases with severity of the disease, meanings REDX's targeted population is an estimated of 10.5m patients that have later stage NASH, who could potentially benefit from an anti-fibrotic therapy.

REDX develops a pipeline of biologically validated targets by leveraging its strong medicinal chemistry capability

Pipeline development

REDX is aiming to bring pre-clinical programmes to development candidate nomination in a relatively short time frame (18 to 36 months) by leveraging its strong medicinal chemistry capability. The pipeline development is based on two main points:

- Work on biologically and/or clinically validated targets with the aim of being first-in-class or best-in-class, through the development of the in-house programmes and the acquisition/in-licencing of assets from other parties.
- Work on commercially attractive targets with high unmet medical need.

Partnering

By developing an asset further along the pipeline that includes a clinical data package, REDX could command even greater value from higher upfront payments, together with better development and regulatory milestones, and royalties on net sales. REDX is also open to forge partnerships to enable programme development at an even earlier stage if this is considered appropriate, thereby unlocking additional shareholder value.

Milestones

2019 is expected to be a year with several major milestones and, hence, many value inflection points. With the agreement in principle from the MHRA to resume the Phase I/IIa with RXC004, REDX is scheduled to submit the new protocol before the end of 2018, which will allow it to resume the clinical trial in 1H'19.

In addition, REDX has ambitions to progress two to three anti-fibrotic assets into the development candidate stage in 2019, with the aim of entering the clinic in 2H'20.

REDX near-term milestones and value drivers to 2020

		2018	2019	2020
Oncology	RXC004	✓ ***1Q*** *First patient treated in Phase 1 study* ✓ ***1H*** *Read-out on pre clinical PoC studies in fibrosis* ✓ *MHRA agreement in principle to re-start Phase 1*	**1H** Phase 1 re-start **1H** ASCO Wnt pathway updates **2H** Phase 1 initial cohort safety data	**1H** Phase 1 safety data readout **1H** IO partnering company decision on phase 1b
Anti-Fibrotics	GI-targeted ROCK	✓ *Patents filed, series assessment ongoing*	**1H** Development candidate selected in Crohn's disease	**2H** First time in man ready
	PORCN/ 06109	✓ *Progressing to development compound*	**1H** Development candidate selected for IPF	**2H** First time in man ready
	ROCK2 selective	✓ *Patents filed, series assessment ongoing*	**2H** Development candidate selected for NASH	**2H** First time in man ready

Source: Redx, Investor presentation 2018

R&D pipeline

The overall R&D strategy consists of a more focused pipeline to develop small molecule therapeutics from discovery to Phase I and up to Phase II proof-of-concept trials with the possibility of out-licensing these assets for late-stage development and commercialisation. This will maximise shareholder value per product. The strategic review also prioritised programmes and some have been halted or made available for out-licensing where they are no longer core to the strategy (e.g. pan-RAF programme).

REDX R&D pipeline

	Target/ Product	Indication	Research	Pre-clinical (CTA/ IND enabling)	Clinical (Phase 1)	Milestone Date
RXC004	Porcupine	Combination with PD1 / PD-(L)1 in solid tumor (colorectal cancer)				Phase 1 completion – 1H2020
Anti-fibrotics	GI-targeted ROCK	Crohn's Related Fibrosis				Pre clinical development 1H2019
	ROCK2 selective	Non-alcoholic Steatohepatitis (NASH)				Pre clinical development 2H2019
	Porcupine (REDX06109)	Idiopathic pulmonary fibrosis (IPF)				Pre clinical development 1H2019
Research	Validated targets (inc. SHP2 & AZ collaboration)	Cancer & Fibrosis				Lead Optimisation 2019/20 & development candidates <36 months

Source: Redx, Investor presentation 2018

Following the successful disposal of its pre-clinical BTK programme for $40m (£30.5m) to Loxo Oncology in July 2017, REDX is also open to partnering programmes at an earlier stage, if considered appropriate. The price achieved was in line with the average for pre-clinical small molecule projects in the field of oncology, but without including milestone or royalty payments. By developing an asset even further along the pipeline to include a clinical data package, then even greater fees and milestones could be expected.

Oncology

RXC004 back in the clinic

Following positive discussions with the MHRA, REDX received agreement, in principle, to resume the clinical study with a revised protocol for its lead programme, the porcupine inhibitor RXC004. The new protocol will be submitted before the end of the year and the trial is expected to re-start in 1H'19. Suspension of the Phase I/IIa trial was seen by the market as a setback; however it is not unusual to pause a clinical study, especially in a phase I oncology trial patient population to adjust the dose, schedule and optimise safety assessments based on emerging data.

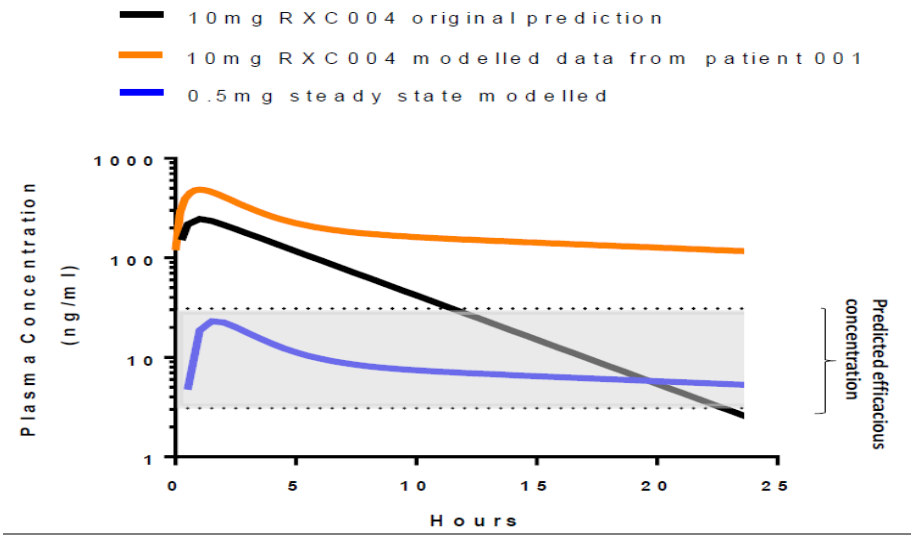
RXC004 showed on-target effect and possesses a different pharmacokinetic profile compared with animal studies

The prudent decision to suspend the trial was based on the observation of some clinically significant adverse events in the first subject following a dose of RXC004. Such events should be anticipated with Wnt inhibition, but at a much higher dose than that used in the trial (10mg per day). Analysis of the data suggested that RXC004 was well absorbed and had an on-target effect. The data also demonstrated that the compound possesses a different pharmacokinetic profile in humans compared with that seen in animal studies with a slightly higher maximal concentration (C_{max}) in the blood system and an extended plasma half-life. These translate to a significantly higher and prolonged exposure of the compound than predicted, leading to levels of the compound above the therapeutic window.

A final version of the protocol will be submitted to the MHRA; this includes a much lower starting dose of RXC004, and is expected to start in 1H'19

On the basis of this clinical information, in conjunction with the study investigators, REDX believes that safety, tolerability and efficacy can be achieved with a lower dose of RXC004, which is the basis of the new trial protocol. The company is now finalising a revised protocol of the Phase I/IIa trial, with submission expected in 4Q'18. This would allow the study to re-start in 1H'19 with a reformulated starting dose 20-fold lower (0.5mg per day) compared with the original protocol. Safety will be the driver of the first part of the study with enhanced monitoring.

RXC004 – Plasma concentration



Source: Redx Investor Presentation Sept 2018

Scientific rationale

By modulating the Wnt pathway, RXC004 is able to turn the 'cold' immune-suppressive tumour micro-environment to 'hot' …

RXC004 is an orally bioavailable small molecule porcupine inhibitor. The porcupine enzyme is a key protein required for the function of the Wnt pathway that is implicated in cell proliferation, survival, migration, cell death and polarity, as well as the maintenance of cancer stem cells (CSC) and immune tumour micro-environment in many cancer types, which results in the recurrence and emergence of cancer resistance. The protein is also believed to play a key role in the field of immuno-oncology when it is combined with a checkpoint inhibitor (CPI).

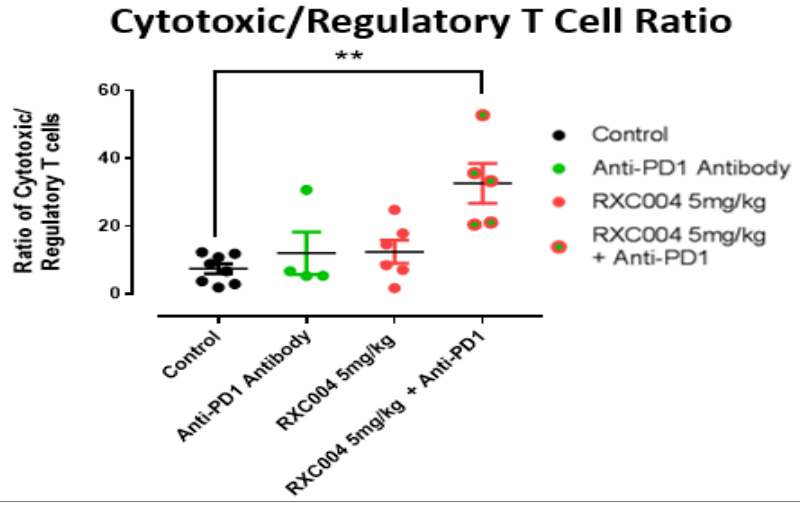
… providing the rationale for a combination with a CPI

- **Immuno-oncology:** An increasing number of scientific publications have demonstrated the implication of the activation of the Wnt signalling pathway in creating an immuno-suppressive micro-environment in tumours allowing immune evasion. Also, REDX has confirmed in pre-clinical studies that RXC004 enhances immune system activation, which could reverse immune evasion in patients that do not respond to CPI. In other words, the mechanism of action of RXC004 and the effect in enhancing the immune response, when combined with

a PD(L)-1 inhibitor, may turn the 'cold' immune-suppressive tumour environment to 'hot'. RXC004 can potentially demonstrate an anti-tumour effect by an immuno-oncology mechanism as monotherapy and/or in combination with immune CPI (anti-PD(L)-1). The RXC004 Phase I/IIa trial, therefore, will explore both immune effect and anti-tumour activity, both as single agent and in combination with immune CPI. The second part of the trial, the basis of the Phase IIa study, aims to potentiate the effect of anti-PD(L)-1 CPI and increase both the response rate (number of patients who respond) and the duration of response (a longer sustained shrinkage in the tumour). This should represent an attractive feature to companies working in the immuno-oncology space.

Dual immune response and anti-cancer effects provide RXC004 with an attractive profile

RXC004 – combination efficacy



Source: Redx Pharma, 14-16 April 2018, AACR Annual Meeting, poster session

- **Targeted therapy:** Pre-clinical experiments showed that RXC004 alone could inhibit tumour growth in a variety of cancer models. Importantly, RXC004 was shown to inhibit tumour growth in a pancreatic tumour model at lower doses than WNT974, Novartis's lead compound, currently in Phase I/II with a PD-1 CPI.

- **Novartis' Wnt programme:** Regarding the safety profile and clinical relevance of a porcupine inhibitor, Novartis leads the way with WNT974/LGK974, which is in early trials for solid tumours. Results to date suggest that WNT974 affects the immune cell signatures in the tumour microenvironment, an effect observed also with RXC004 in pre-clinical models. In addition, Novartis indicated at the AACR meeting that a second arm of the study is currently running using WNT974 in combination with its anti-PD(L)-1 antibody, spartalizumab. Although Novartis is leading the field, REDX remains a close follower with a compound that seems to have greater exposure (longer half-life) compared with WNT974.

Phase I/IIa clinical trial

The new trial will enrol a total of ca.50 patients at three sites (Manchester, Oxford and Newcastle), with the possibility of adding a fourth site, with Natalie Cook, at the NHS Foundation Trust in Manchester as the Principal Investigator. This first-in-man study represents a major milestone for the company, being the first programme that REDX has advanced since incorporation in 2010 from discovery to the clinic.

The Phase I/IIa clinical trial is focusing on cancers that have a poor prognosis. The study will be comprised of two parts:

- **Phase I:** a multi-arm dose-escalating study, from 0.5mg to 3mg (estimated), designed to assess the safety and tolerability of RXC004 in advanced cancer patients with solid tumours, as a single agent and to establish the optimal dose for Phase IIa. The trial is expected to complete in 1H'20 with the release of safety and tolerability data. It is also possible that early data could be made available during 2019.
- **Phase IIa:** an expansion arm of RXC004 in combination with immuno-oncology agents such as anti-PD(L)-1 (CPI) in colorectal cancer, for example.

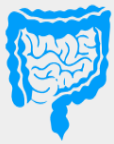
Following positive results, a study in combination with an immuno-oncology agent such as anti-PD(L)-1 inhibitor is also confirmed

Fibrotic diseases

The second area of focus is the large spectrum of fibrotic disease with high unmet medical needs. With three programmes, REDX is aiming to encompass a vast range of fibrotic conditions that severely affect the quality of life and could also be life threatening, like IPF.

Targeting fibrotic diseases

Idiopathic Pulmonary Fibrosis (IPF)
Product: Porcupine



Crohn's related fibrosis
Product: GI-targeted-ROCK

Non-alcoholic Steatohepatitis (NASH)
Product: ROCK2

Source: adapted from Redx Pharma

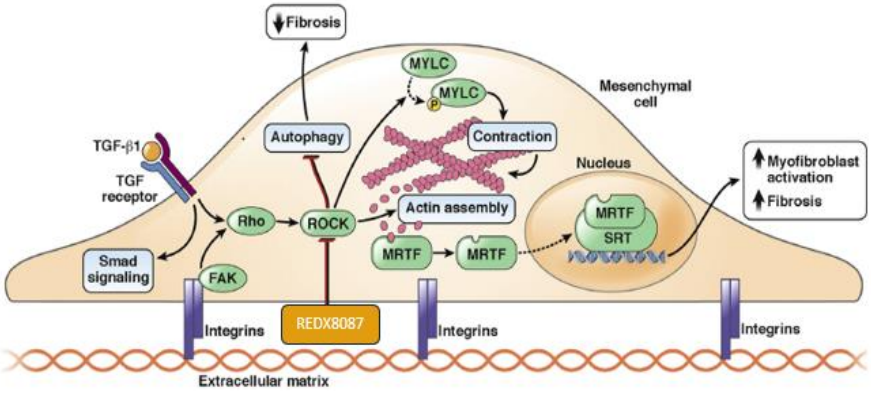
GI-targeted ROCK inhibitors for Crohn's disease

REDX's ROCK1/2 inhibitor is having a locally acting and targeted approach to the gut, making it an attractive asset for the treatment for Crohn's-related fibrosis

REDX has developed a novel series as a potent GI-targeted ROCK1/2 inhibitor with potential to be first-in-class. Systemic exposure of its GI-targeted ROCK inhibitor is limited through poor absorption and rapid degradation by specific blood esterases and allows selective targeting of the gut. It means that the ROCK inhibitor is having a locally acting and targeted approach to the gut and is rapidly metabolised if absorbed, avoiding the known hypotensive side effect of systemic dual ROCK1/2 inhibition.

With the GI-targeted ROCK1/2 inhibitors, REDX targets primarily the population of patients affected by Crohn's disease that will develop intestinal wall fibrosis, a complication that occurs in 50% of Crohn's patients. There is currently no approved pharmaceutical treatment for Crohn's-related fibrosis and REDX believes that it can be the first to reach the clinic for this indication.

Targeting fibrotic diseases for immunology projects



Source: Holvoet et al; Gastroenterology 2017, 1054-1067

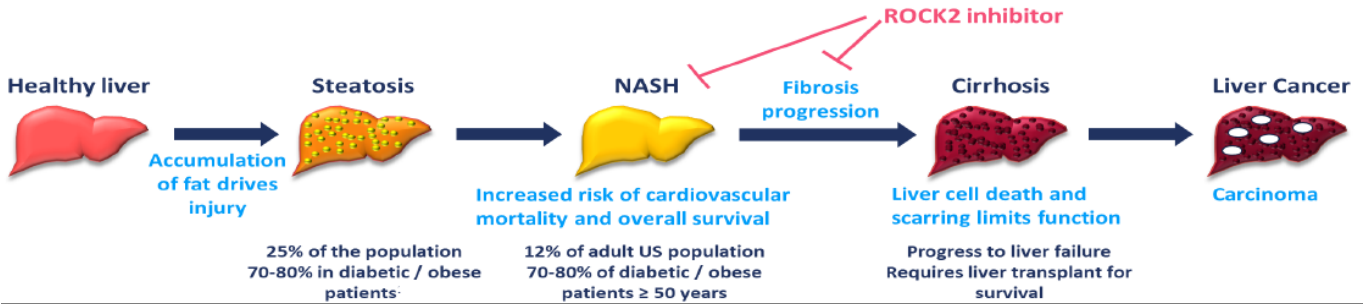
REDX has disclosed that a lead product has demonstrated efficacy in a range of animal IBD fibrosis models already and the company is expecting to announce choice of clinical candidate for development in 2019. At the point of reaching late-stage lead optimisation, REDX acquired the rights to this programme from Amakem NV. REDX will be targeting primarily the population of patients affected by Crohn's disease that go on to develop intestinal wall fibrosis. REDX has the opportunity to develop a product that has the potential to not only stop, but also to eventually reverse the formation of fibrotic tissues. The aim is to start the pre-clinical development work during 1H'19.

ROCK2 programme for NASH

REDX is also developing a ROCK2 selective inhibitor for NASH

The ROCK2 programme is at the lead optimisation stage, and REDX's focus is on its application in pro-fibrotic cell types that could potentially cover a large spectrum of diseases. The benefit of having a potent selective ROCK2 inhibitor is that systemic anti-fibrotic effects can be achieved without the hypotensive side effect seen with dual ROCK1/2 inhibition.

Pipeline



Source: Redx, Investor presentation 2018

REDX is focusing on NASH where there are currently no approved therapies to reverse the liver damage. Current treatments are more about diet and medications to reduce cholesterol and triglycerides, blood pressure and to control diabetes. The main complication is the progression of NASH into liver cirrhosis that means permanent scarring and hardening of the liver which can ultimately lead to liver cancer.

The ROCK2 inhibitor demonstrated a good pre-clinical profile

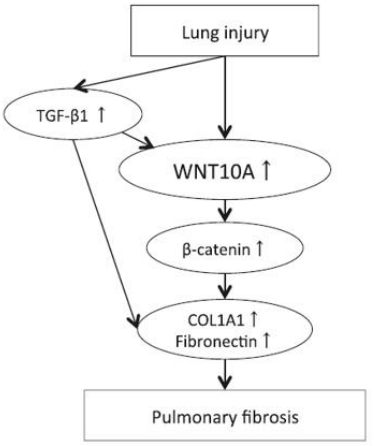
REDX has indicated that its orally available ROCK2 inhibitor demonstrated a good pre-clinical profile showing improvement compared with Kadmon's ROCK2 inhibitor KD025, currently in Phase II trials in multiple indications: chronic graft-versus-host disease, IPF and scleroderma. Kadmon has indicated in its Phase II study that KD025 slowed the decline in lung function over 24 weeks of treatment and that it is well tolerated with no drug-related serious adverse event. This represents a great endorsement for REDX in treating fibrotic conditions with ROCK2 inhibition. REDX aims to enter into the pre-clinical development stage in 2H'19, with a view to being in the clinic in 2020.

Porcupine programme for IPF

Inhibiting the porcupine protein, and thus the Wnt pathway, has an influence also in the development of fibrotic conditions through its role in increasing the level of several pro-fibrotic proteins. The influence of Wnt activation of β-catenin signalling in fibroblasts is believed to trigger the fibrotic pathology in various organs such as lung, liver and kidney. There is currently no cure for IPF and the 5 year survival rate is around 20% according to the UKs National Health Service (NHS), and the median survival in the US is estimated at 3-4 years after diagnosis (National Institute of Health). The standard of care is just to relieve the symptoms as much as possible (oxygen mask) and slow down the scarring of the lungs. The standard of care includes also the use of medications such as:

- **Esbriet** (pirfenidone, Roche) approved in the US (2014) and Europe (2011) with cumulative sales of $2.3bn and works by reducing lung fibrosis through down-regulation of the production of growth factors and procollagens I and II.
- **Ofev/Vargatef** (nintedanib, Boehringer Ingelheim) approved in the US (2014) and Europe (2015) with cumulative sales of $2.0bn and works by targeting the vascular endothelial growth factor receptor, fibroblast growth factor receptor and platelet derived growth factor receptor.

Lung fibrosis



Source: Oda et al, 2016

The porcupine inhibitor for fibrosis belongs to a series distinct from RXC004

For this condition, REDX is developing a new series of compounds distinct from RXC004 and protected by a different patent family, with REDX06109 being the lead product. REDX06109 has demonstrated encouraging results in suppressing fibrosis in different *in vivo* disease models that include kidney, liver and lung, and that there is evidence the product could also be effective in patients with advanced fibrosis. The development candidate is expected to be announced in 1H'19.

Financials & Investment case

Valuation

Discounted cashflow

The best approach to valuing biopharmaceutical companies is to prepare detailed discounted cashflow analyses of key products through to patent expiry and then to risk-adjust the NPV based upon industry standards for the probability of the product reaching the market. In this instance, the assets are at too early a stage to do a DCF valuation without exhaustive analysis of the market opportunities, penetration rates and potential milestones and royalty payments. Equally, the probabilities of successfully reaching the market for pre-clinical assets is typically less than 5%.

Suffice to say, REDX's approach to developing "best-in-class" in biologically validated programmes targeting markets of significant unmet clinical need, indicative of $1bn+ sales potential, suggests that these assets will all be attractive to big pharma and/or biotech companies. To that extent, it is probably more relevant to look at what large pharma is prepared to pay to gain access to such molecules.

Comparative valuation – M&A

The following table provides some indication of the value that big pharma and biotech put on novel assets, even in early stages of pre-clinical development in oncology, including screening, discovery, lead optimisation, toxicology and IND enabling studies. It is not exhaustive, but we look at the transactions where financial terms were disclosed. There are many more deals where financial terms were not disclosed at all. We have also looked at a number of transactions where the assets were in clinical development to better illustrate the value inflection points on successful completion of pre-clinical phases and demonstration of safety in first-in-man studies.

Pre-clinical asset

- The median up-front licence deal value of pre-clinical compounds in the Immuno-Oncology and oncology space in the 2016-17 period is $32m per target compound with milestones of up to $562m.

Pre-clinical oncology deals							
Licensor	**Licensee**	**Type of deal**	**Stage of Development**	**Date**	**Upfront ($m)**	**Milestones ($m)**	**Comments**
Loxo Oncology	Redx Pharma	Acqn.	Pre-clinical	Jul-17	40	0	Assets and IP of BTK programme
Celgene	Dragonfly	Lic.	Pre-clinical	Jun-17	33	0	Option to license up to four I-O assets
Novo Nordisk	Innate Pharma	Lic.	Pre-clinical	Jun-17	45	415	Global rights to IPH5401; double-digit royalties
Merck KGaA	F-Star	Lic.	Pre-clinical	Jun-17	30	1,000	Upfront of €115 includes R&D and first 2-year milestones
BioLineRx	AgaImmune	Acqn.	Pre-clinical	Mar-17	6	U/D	Significant R&D spend required
Amgen	Inmatics	Lic.	Pre-clinical	Jan-17	30	1,000	Bi-specific antibodies
Servier	Pieris Pharma	Lic.	Pre-clinical	Jan-17	32	1,900	Access to PRS-332 + stake in four other assets
Pfizer	BioInvent	Lic.	Discovery	Dec-16	16	500	Research collaboration + commercialisation of up to five antibody drugs
Bristol-Myers	Enterome	Lic.	Discovery	Nov-16	15	U/D	Microbiome expertise to boost cancer immunotherapies
Bluebird	Medigene	Lic.	Pre-clinical	Sep-16	15	1,000	Milestones and tiered royalties
Amgen	Advaxis	Lic.	Pre-clinical	Aug-16	40	475	Access to ADXS-NEO cancer immunotherapy
Celgene	Jounce Ther.	Lic.	Pre-clinical	Jul-16	225	2,300	Access to JTX-2011 and up to four other assets
Servier	Sorrento Ther.	Lic.	Pre-clinical	Jul-16	28	785	Access to anti-PD-1 STI-A1110
Ono	Celyad	Lic.	Pre-clinical	Jul-16	12	306	Rights to NKR-2 T-cell immunotherapy in SE Asia
JNJ	MacroGenics	Lic.	Pre-clinical	May-16	75	665	Global rights to MGD015 bi-specific
AbbVie	Argenx	Lic.	Pre-clinical	Apr-16	40	625	ARGX-115 + milestone + dd royalties
Merck & Co	Iomet Pharma	Acqn.	Pre-clinical	Jan-16	U/D	400	$400m acquisition
				Average	**46.6**	**739.8**	
				Median	**32.0**	**562.5**	

Lic.: Licence; Acqn.: acquisition
Source: Hardman & Co Life Sciences Research

Phase I clinical asset in oncology

- A median deal value for Phase I assets of $81.5m in the 2016-18 period and with similar median milestone payments than pre-clinical assets.

Phase I oncology deals

Licensor	Licensee	Type	Date	Upfront (m)	Milestones ($m)	Milestones
Lilly	Aurka Pharma	Acqn.	May-18	110	465	Aurora kinase I programme
Incyte	MacroGenics	Lic.	Oct-17	150	750	Worldwide rights to PD-1 drug
Merck & Co	Rigontec	Acqn.	Sep-17	137	415	Company buy out
Celgene	Beigene	Lic.	Jul-17	263	1,000	Worldwide ex-Asia rights to BGB-A317
Incyte	Calithera Bio.	Lic.	Jan-17	53	430	Global collaboration & licensing agreement for CB-1158
Five Prime Ther.	BMS	Lic.	Oct-16	350	1,390	Anti-CSF1R for oncology/non-oncology indication
Sierra Onc.	Sareum/CRT Pioneer Fund	Lic.	Sep-16	7	322	Sareum has rights over 27.5% of all payments from Sierra
Celgene	Juno	Lic.	Aug-16	50	1,000	CD19 programme ex-North America and China
Novartis	Xencor	Lic.	Jun-16	150	2,410	Access to bi-specific antibodies: XmAb5871
CANbridge Life Sci.	Aveo Oncology	Lic.	Mar-16	1	132	World, excl. North America, rights to AV-203
Alligator Bio.	Janssen	Lic.	Aug-15	U/D	700	$700m deal size including upfront payments, dev/reg & sales milestones, plus royalties
Newlink Genetics	Genentech	Lic.	Oct-15	150	1,000	>$1bn. US co-promote option
CureVac	B. Ingelheim	Lic.	Sep-14	45	556	€430m ($556m)
Adaptimmune	GSK	Lic.	Jun-14	U/D	U/D	Undisclosed
Macrogenics	Servier	Lic.	Dec-11	20	40	$40m: exercise fee and early dev.
Innate	BMS	Lic.	Jul-11	35	430	Milestones & DD royalties
			Average	**108.6**	**736.0**	
			Median	**81.5**	**556.0**	

Lic.: Licence; Acqn.: acquisition
Source: Hardman & Co Life Sciences Research

Financial summary

- **SG&A:** Ongoing central administration and corporate overhead has been lowered and is expected to rise in-line with inflation.
- **R&D:** Comprised of two main items: the ongoing R&D staff and consumable costs; plus, the external (e.g. CRO) R&D costs of running clinical trials. Two Phase I/IIa trials are expected to begin in each of the next two financial years, with external costs of about £3-4m per annum.
- **Tax credits:** Remains conservative, and in the absence of other local grants or rebates, more of the R&D spend is likely be eligible for R&D tax credits in future.
- **Cash burn:** We believe that the revised business plan is operating to an average cash burn of £630-650k per month on top of which will be the external investment in R&D.
- **Net cash:** REDX has sufficient cash until 1H'19.
- **Capital requirement:** Solely for the purpose of modelling, we assume that management raises ca.£10m for R&D investment and working capital purposes early in fiscal 2019.

Financial summary

Year-end Sep (£m)	2015	2016	2017	2018E	2019E	2020E
SG&A	-2.01	-2.21	-5.70	-3.15	-3.28	-3.41
R&D	-9.46	-14.32	-13.00	-6.53	-11.08	-11.41
Licensing/royalties	0.00	0.00	0.00	0.00	0.00	0.00
Underlying EBIT	**-8.82**	**-14.15**	**-17.41**	**-8.68**	**-13.35**	**-13.82**
Share-based costs	-0.61	-0.25	-0.01	-0.20	-0.22	-0.24
Statutory EBIT	-8.54	-14.95	-24.94	-9.27	-13.57	-14.06
Net financials	-0.29	-0.46	-3.89	0.03	0.03	0.00
Pre-tax profit	**-9.11**	**-14.61**	**-17.74**	**-8.65**	**-13.33**	**-13.82**
Reported taxation	0.65	-0.11	-0.12	0.39	0.66	0.68
Underlying net income	-8.46	-13.97	-17.86	-8.26	-12.66	-13.13
Underlying basic EPS (p)	**-14.58**	**-17.83**	**-15.80**	**-6.53**	**-8.85**	**-8.22**
Statutory basic EPS (p)	-14.09	-19.81	1.35	-7.00	-9.00	-8.37
Balance sheet						
Share capital	0.65	0.94	1.27	1.26	1.60	1.60
Reserves	7.05	0.78	13.06	4.21	1.00	-12.37
Capitalised R&D	21.21	30.10	36.05	34.71	36.54	37.65
Loans	2.00	2.00	0.00	0.00	0.00	0.00
less: cash	9.44	5.76	23.81	5.59	2.72	-10.38
Invested capital	**20.72**	**27.46**	**26.57**	**34.59**	**36.41**	**37.25**
Cashflow						
Underlying EBIT	-8.82	-14.15	-17.41	-8.68	-13.35	-13.82
Depreciation	0.14	0.26	0.33	0.18	0.18	0.18
Working capital	2.01	1.15	7.69	-9.51	0.04	0.04
Other	0.02	-0.56	-4.99	-0.40	0.00	0.00
Company op cashflow	**-6.65**	**-13.29**	**-14.38**	**-18.41**	**-13.14**	**-13.60**
Capital expenditure	-0.36	-0.44	-0.03	-0.15	-0.16	-0.17
Share issues	0.00	0.00	30.47	0.00	0.00	0.00
Change in net debt	13.45	9.30	11.07	0.00	10.00	0.00
Period end net cash	**6.54**	**-3.68**	**20.05**	**-18.21**	**-2.88**	**-13.10**

Source: Hardman & Co Life Sciences Research

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