Ultragenyx Pharmaceutical, Inc. (RARE)

A RARE Portfolio; Initiating with a Buy and $82 PT

RARE boasts a portfolio of mid- to late-stage clinical assets to tackle genetic ultra-orphan diseases. With 4 clinical stage therapies developed for 5 indications, we anticipate a slew of data catalysts in 2015, with potential product approvals in 2017/18. **Physician feedback suggests all programs have good clinical probabilities of success.**

KRN23 anchors the pipeline with the highest likelihood of success and a large opportunity. Phase I/II data for this FGF23 antibody showcased its ability to increase blood phosphate in patients with XLH (a rare disorder whereby serum phosphate levels are abnormally low, patients do not form bone properly). Physicians believe that these data will translate into bone improvement in adult and pediatric patients, in ongoing and planned Phase II studies. We model for $952M peak WW sales of KRN23 in 2028, corresponding to $306M attributable to RARE.

rhGUS is somewhat low-risk, but addresses a small market. rhGUS development for MPS VII is analogous to successful enzyme replacement approaches for other MPS subtypes. It has demonstrated clinical benefit, as evidenced by robust decreases in uGAG (urinary protein-fat molecules) in a Phase I/II trial. With pivotal data in 2015, rhGUS could be RARE's first product to reach the market. We model for peak sales of $73M in 2028.

Triheptanoin could address the greatest opportunity, with 2 indications. Triheptanoin is a fatty acid in Phase II testing for LC-FAOD (patients are unable to use fat for fuel, and faint or die suddenly) and Glut1 DS (rare form of epilepsy where sugar does not enter the brain). The drug has been validated by over a decade of use as a medical food, and similarity to the ketogenic diet, which is effective but plagued by poor compliance. We model for WW peak sales of $610M in 2028.

SA-ER for HIBM may soon enter the limelight. SA-ER is in development for a progressive muscle weakness disorder called HIBM. In Phase II, SA-ER demonstrated a reduction in the rate of upper-body strength decline, although there was no improvement in lower-body strength decline. SA-ER will enter Phase III in mid-15 at the 6g dose. We model for WW peak sales of $51M in 2028.

Four major catalysts could drive significant upside in 2015; $1B in peak sales potential. We expect interim Phase II data from both triheptanoin programs in mid-15. KRN23 (Phase II) and rhGUS (Phase III) data are expected in Q4 2015, and we view both as likely to succeed. For KRN23, we expect to see the drug's established effect of increasing serum phosphate to translate into improved bone health. For rhGUS, we expect pivotal data showing robust uGAG (and potentially Individualized Clinical Response outcome) improvement.

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Initiate Buy

Price Target: $82.00

Price (Oct. 14, 2014)	$44.51
52-Wk Range	$66.18-$33.36
Market Cap ($M)	$1,340
ADTV	456,823
Shares Out (M)	30.1
Short Interest Ratio/% Of Float	8.1%
TR to Target	84.2%

Cash Per Share	$7.08
Total Debt	$0.0
Cash And Equivalents ($M)	$153.0

	2013A	2014E		2015E	
		Curr.	Prior	Curr.	Prior
EPS Adjusted					
1Q	(3.36)	(0.85)A	--	(0.82)	--
2Q	(3.23)	(0.45)A	--	(0.62)	--
3Q	(2.58)	(0.47)	--	(0.65)	--
4Q	(4.98)	(0.55)	--	(0.69)	--
FY	(14.15)	(2.23)	--	(2.77)	--
P/E	NM	NM		NM	
Revenue ($M)					
FY	$0	$0	--	$0	--
Consensus EPS					
FY	($11.25)	($2.02)A	--	($2.16)	--
Consensus Rev					
FY	$0	$0	--	$0	--
FYE Dec					

SEE PAGE 54 FOR REQUIRED DISCLOSURE INFORMATION

Ultragenyx Bull/Base/Bear Scenarios

Figure 1: Ultragenyx Bull vs Bear Analysis

	Bear Case	STRH case	Bull Case
KRN23	$ 12.24	$ 23.65	$ 32.36
rhGUS	$ 3.48	$ 8.13	$ 8.95
Triheptanoin	$ 30.30	$ 42.89	$ 51.48
SA-ER	$ 1.60	$ 1.97	$ 2.45
Cash/share	$ 5.72	$ 5.72	$ 5.72
Implied Price Target	**$53.33**	**$82.36**	**$100.95**
STRH est. scenario probability	10%	60%	30%
Price as of 10/02/2014		$44.51	
Upside/downside	*20%*	*85%*	*127%*

Source: STRH estimates

Our base case valuation scenario reflects a 2% terminal growth rate for KRN23, triheptanoin, and SA-ER, and 3% for rhGUS. These terminal growth rates reflect the absence of any other competitors in the near term, and the more durable barriers to entry for ERTs (rhGUS). We conservatively assign KRN23 a 75% probability of success of reaching our estimates as some adult XLH patients may not have severe enough disease to warrant treatment. We assume an 85% probability of success for rhGUS, given the similarity to other MPS disorders, 60% for triheptanoin due to uncertainties surrounding the pivotal endpoints, and 50% for SA-ER due to efficacy on the upper body, but not lower body endpoints thus far. Our base case implies a price target of $82, 85% higher than the stock price on 10/14/2014. We assign a 60% probability to our base case, subject to adjustment as we receive additional data on the 5 pipeline indications.

Our bear case assumes a 50% probability of development and commercial success for each of KRN23, rhGUS, triheptanoin, and SA-ER. If the company were to fail to identify enough patients for any of these products, we believe they would warrant a lower terminal value at 1%, and we assume a higher discount rate at 10-11%. In a bear case scenario, some of Ultragenyx's products may fail in the clinic. We believe that this scenario is rather unlikely, and we assign it a 10% probability. We note that should some of Ultragenyx's products fail, we believe the company will have ample opportunity to in-license other products to replenish the pipeline. Our bear case implies a price target of $35, 20% higher than the stock price on 10/14/2014.

Our bull case would entail 3% growth rates for KRN23 and rhGUS, and 2% for Triheptanoin and SA-ER. We assume a discount rate of 9% for each pipeline asset. These would reflect, for KRN23, sustained uptake into the XLH pediatric and adult populations and for triheptanoin, success in both Glut1 DS and LC-FAOD, and upside to our estimates of patient numbers. rhGUS would be taken up quickly by the MPS VII population, reaching ~90% penetration. Finally, SA-ER would demonstrate robust benefits on preserving muscle strength in a longer-term trial, which we model with a 2% growth rate from widespread use in HIBM patients. Our bull case scenario reflects a 75% probability of success for KRN23, 85% for rhGUS, 60% for triheptanoin, and 50% for SA-ER. We assign this scenario a 30% probability. We reach a price target of $101, an 127% premium over closing price on 10/14/2014.

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We are Initiating Coverage of Ultragenyx with a Buy Rating and $82 PT

Ultragenyx has a broad pipeline focused on ultra-rare genetic diseases, with a flurry of catalysts expected in 2015. Ultragenyx's pipeline consists of 4 clinical-stage therapeutic candidates, addressing 5 ultra-orphan diseases, an area of drug development which benefits from early proof-of-concept (POC), abbreviated timelines from preclinical development to commercial approval, high pricing power and favorable exclusivity (7 years in the U.S., 10 years in the E.U.). Ultragenyx in-licensed these four drug candidates and retains full worldwide rights for two of them. The main value drivers are 1) KRN23 for X-linked hypophosphatemia (XLH), a common form of inherited rickets (Ultragenyx retains ~33% of the economics for this product) and 2) triheptanoin for glucose transporter type-1 deficiency syndrome (Glut 1DS), and long-chain fatty acid oxidation disorder (LC-FAOD), two orphan diseases whereby a patient's cells are unable to metabolize sugar in an appropriate fashion, causing neurological and muscle/liver issues, respectively. Ultragenyx is also developing recombinant human beta-glucuronidase (rhGUS), an enzyme replacement therapy (ERT) for a devastating rare disease with life expectancy of ~20 years, mucopolysaccharidosis type VII (MPS VII), and sialic acid extended release (SA-ER) tablets for hereditary inclusion body myopathy (HIBM), a progressive muscle wasting disorder in which patients become steadily weaker over time, eventually becoming bedridden. The key value drivers are KRN23 and triheptanoin, given the size of the addressed populations (~55K and ~33K patients worldwide for KRN23 and triheptanoin, respectively). We view rhGUS for MPS VII, the latest-stage program, as a somewhat de-risked program given the multiple drugs approved for MPS disorders, however the company remains in discussions with the FDA regarding the primary endpoint, with a Phase III study expected to begin in Q4 2014. SA-ER is likely entering a Phase III program with the 6g dose in mid-2015. Discussions with physician consultants lead us to believe that all five programs have high probabilities of success, and we anticipate sustained newsflow in 2015 and beyond from the ongoing mid- to late-stage clinical trials. We highlight management's track record of successful drug development in the orphan disease area, with the Chief Executive Officer Dr. Emil Kakkis having previously served as Chief Medical Officer at orphan disease stalwart BioMarin. Ultragenyx's management team has also been involved with the development and commercialization of Aldurazyme, Naglayzme, VIMIZIM, Kuvan, asfotase alfa, and others. The diversified portfolio will allow the company to tolerate the failure of any single drug.

Several potentially de-risking data readouts in H2 2015 should serve as catalysts. We expect interim Phase II data from both triheptanoin programs (LC-FAOD and Glut1 DS) in mid-2015. In LC-FAOD, we will be looking for triheptanoin to demonstrate reductions in hospitalization rates and a slew of exploratory endpoints that will help in the Phase III design. For Glut1 DS, we look for a reduction in seizure event rates. In Q4 2015, we expect interim data from KRN23's Phase II pediatric trial and rhGUS's pivotal Phase III in MPS VII. On

KRN23, we will be looking for evidence that the antibody is able to improve bone formation in children. Our physician consultants note that they would view this as a clinically significant result. For rhGUS, the primary endpoint is under discussion with the FDA, with the EMA willing to accept uGAG reduction (physicians expressed some doubts related to the clinical benefit of this endpoint) but wanting to see a trend in a secondary endpoint.

KRN23 anchors the pipeline as a large opportunity with the highest probability of success. We view this program as having the highest chances of success due to strong biological rationale and promising initial human data. KRN23 has shown the ability to increase plasma phosphate to normal levels in XLH patients in a Phase I/II study. As the disease is believed to be caused by the lack of available raw material (phosphate) to build bone, the presence and availability of phosphate is likely to restore appropriate bone development. We model for KRN23 approval and launch in 2018. We estimate that there are approximately 9,000 adult and 3,000 pediatric XLH patients in the U.S. The pediatric population is likely more severe with greater motivation to begin therapy. Thus, we model for peak penetration in 2028 of 18% into the adult and 43% into the pediatric population in the U.S., 15% and 33% in the E.U, and 5% and 11% in the ROW. We assume an annual price of $100K, corresponding to $953M in peak worldwide sales in 2028 and $306M peak revenue attributable to Ultragenyx.

rhGUS appears somewhat de-risked, addressing a niche market opportunity and is entering Phase III in Q4 2015. For rhGUS, the similarity of this program to other MPS enzyme replacement technologies and solid preclinical and early clinical data has de-risked the program to some extent. rhGUS has shown the ability to decrease uGAG in humans, and we look forward to seeing that translate into clinically meaningful outcomes during the Phase II extension and pivotal Phase III trials. Ultragenyx intends to conduct one pivotal clinical trial for worldwide regulatory submission with two primary endpoints. One primary endpoint of Phase III trial will be reduction in uGAG. Our discussions with management indicate that the EMA is likely to accept this endpoint, but would probably also like to see at least a trend on a secondary endpoint. We believe the company has not reached a definitive conclusion with the FDA on the second primary endpoint (given they will not accept uGAG). The company is investigating the use of an Individualized Clinical Response (ICR) score that could be unique for each patient based on their own manifestations of disease. Patient surveys are underway to determine how the ICR might work. We expect regulatory agencies to work with Ultragenyx to design rational endpoints for trials in diseases like MPS VII where there are likely not enough patients that could feasibly be enrolled in a trial to power the more accepted 6MWT or FVC endpoints. We expect data from the Phase III trial in Q4 2015, supporting approval and commercialization in early 2017. We estimate that there are approximately 200 MPS VII patients worldwide. Thus, we model for peak penetration of 93% in the U.S, and 79% in the E.U. We assume an initial price of $400K, leading to peak revenue of $73M in 2028.

Triheptanoin for LC-FAODs and Glut1 DS could provide the greatest upside if successful. Both programs benefit from proof-of-concept with similar mechanisms of action to the ketogenic diet, which appears to have efficacy in both disorders. Early clinical proof-of-concept comes from several investigator-sponsored trials that used food-grade triheptanoin to show promising efficacy, although by means of anecdotal case reports and uncontrolled studies. If efficacy is borne out in rigorous clinical trials, the relatively larger patient populations will render triheptanoin Ultragenyx's biggest drug. We expect interim Phase II data from both programs (LC-FAOD and Glut1 DS) in mid-2015, and launch in 2018 post a Phase III trial. We estimate that there are 2.5K LC-FAOD patients in the U.S., 4.2K in the E.U. and 5.8K in the ROW. We model for peak penetration of 25%, 24%, and 20%, respectively. For Glut1 DS, we estimate that there are approximately 4.2K patients in the U.S., 6.8K in the E.U., 9.5K and in ROW. We model for peak penetration at 30%, 27%, and 20%, respectively. We assume an annual price of $75K, leading to peak revenue of $610M in 2028 in LC-FAOD and Glut1 DS. We do not currently model for triheptanoin use in other subtypes of epilepsy or other metabolic disorders, and view those indications as upside to our estimates.

SA-ER for HIBM will move forward into Phase III next year, likely at the 6g dose. Results from a Phase II study of SA-ER in HIBM were mixed, with the 6g dose demonstrating efficacy on upper body muscle strength but not lower body muscle strength. Some 6g patients benefitted from baseline characteristics closer to normal, thereby rendering this result harder to interpret. Ultragenyx increased the dose to 12g in an extension study, which did not demonstrate an efficacy benefit over the 6g dose, and gastrointestinal side effects were slightly worse. From our discussions with management, we believe the company will move forward with the 6g dose into Phase III. We model for positive data in 2016 supporting approval and commercialization in 2017. We estimate that there are approximately 1.2K - 2K patients in the developed world, with 300-400 of those in Japan (200 of which have been diagnosed and identified). Our physician consultants suggest that a high proportion of diagnosed patients will be treated. Thus, we model for peak penetration at 83% in the U.S., 81% in the E.U., and 66% in ROW. We assume annual pricing of $50K, which would translate into peak revenue of $69M in 2028.

Our physician feedback was positive on Ultragenyx's pipeline products. Our physician consultants were positive on the probability of success for Ultragenyx's products, both from a clinical and commercial standpoint. They anticipate broad uptake upon approval, based on the severe symptoms of the targeted diseases, and lack of current effective treatment options. Specifically, physicians have conviction that increases in serum phosphate seen with KRN23 will translate into restored bone formation ability in pediatric and adult XLH patients. Physicians believe that at least 50% of the adult XLH population is severe enough to warrant treatment with the antibody. For MPS VII, there are currently no therapies available, and replacing the missing enzyme has resulted in clinical success in several other MPS disorders. Physicians believe that triheptanoin for LC-FAOD is likely to be efficacious because patients who are able to avoid fasting typically do well, but that this is challenging and often

patients forget to eat for some period of time, leading to hospitalization. On triheptanoin for Glut1 DS, physicians note that the efficacy of ketones from the ketogenic diet provides proof-of-concept for a replacement energy source, but that the diet has poor compliance which to leads to poor efficacy in most patients. Triheptanoin would allow Glut1 DS patients to normalize their diet and benefit from an effective therapy. Finally, SA-ER has been de-risked on the upper-muscle extremity endpoint. Physicians view this effect as clinically meaningful, although they hope for success on the lower-extremity endpoint as well in a Phase III trial. Physicians also tended to view these diseases as underdiagnosed (common for rare diseases), creating potential upside to our estimates.

Ultragenyx is led by an experienced management team, with an expansive track record in the ultra-orphan space. The CEO, Emil Kakkis, is the former Chief Medical Officer of BioMarin who led the company's clinical development effort, including enzyme replacement therapies, for over a decade. He is joined by at least 5 other senior alumni from BioMarin across several functions including technical operations, regulatory affairs, clinical program development, commercial planning, and research. The team's expertise attracts collaborations from both other companies (KHK on KRN23) and academic thought leaders who want to see their novel therapeutics developed competently (triheptanoin in both indications and rhGUS for MPS VII).

A diversified portfolio approach to drug development mitigates risk. While many early stage biotechnology companies live or die based on the success of only one program, Ultragenyx has 5 currently in the clinic, 1 preclinical, and the plans, cash, and connections to in-license more. In reality, it is unlikely that every single asset the company attempts to develop will find clinical success, but we view the likelihood of success as high with the current portfolio, and Ultragenyx is best positioned to generate actionable data efficiently from creative, adaptive trial designs, providing optionality to R&D spend.

Ultragenyx is well-capitalized to take many shots on goal, $1B in peak revenue to Ultragenyx. As of July 15th, 2014, we estimate Ultragenyx had over $210M in cash and equivalents (post a secondary equity offering in Q2). The company's operating expenses for Q2 were $13.6M. We forecast that the company's cash reserves are sufficient to provide runway into mid-2016. We model for peak revenue to Ultragenyx of $1.0B in 2028. While we do not model for revenue of earlier stage assets including rhPPCA, they provide potential upside to our estimates.

Valuation

We arrive at our 12-month price target of $82 by means of a sum-of-the-parts discounted cash flow analysis, which ascribes $23.60/share to KRN23, $8.10/share to rhGUS, $42.90/share to triheptanoin, $2.00/share to SA-ER and $5.72/share in cash, with the following assumptions: we assign KRN23 a 75%

probability of success, rhGUS an 85% probability of success, triheptanoin a 60% probability of success and SA-ER a 50% probability of success. We assign a discount rate of 10% to KRN23, triheptanoin, and SA-ER, and a 9% discount rate to rhGUS. We assume a 2% terminal growth rate for KRN23, triheptanoin, and SA-ER, and a 3% terminal growth rate for rhGUS.

Investment Risks

The primary investment risks for Ultragenyx include the following:

- **Clinical development risk:** Clinical efficacy for each product may not translate from early results (preclinical, Phase I, or historical case reports) into efficacy in pivotal studies, particularly for products such as triheptanoin for Glut1 DS where limited data have been released to date.
- **Regulatory risk:** Even though clinical studies of Ultragenyx' products may meet their primary (and/or secondary) endpoints, regulatory agencies such as the FDA may not agree with the company that these clinical data warrant regulatory approval for commercialization. In particular, we highlight the risk of the FDA not accepting biomarker endpoints aimed at supporting registration through the Accelerated Approval pathway.
- **Commercial risk:** Given the orphan nature of the indications pursued by Ultragenyx, there exist a number of risks that the company fails to achieve revenues in line with our peak estimate (e.g. patients are not easy to identify, the market size and penetration rates are lower than projected, pricing is lower than anticipated or the company faces delays or setbacks securing reimbursement).
- **Competitive risk:** A few therapies are currently approved and used for the treatment of diseases such as XLH, LC-FAOD, Glut1 DS (albeit with limited clinical benefit). A number of products are currently in development, however, for these indications, as well as for MPS VII and HIBM. The advent of competing therapies may reduce Ultragenyx's market share.
- **Partnership risk:** Ultragenyx relies on partnerships for some of its therapies such as KRN23 (partnership with KHK). KHK manufactures and will commercialize the product in the E.U., thus Ultragenyx is vulnerable to shortcomings of its commercial partners.
- **Management risk:** Ultragenyx relies on a management team with a well-established track record of development and commercialization of orphan drugs. Should the company not be able to retain key members of the management team, its revenue and earnings outlook may be significantly impacted.
- **Financing risk:** As a development stage company, Ultragenyx is not profitable and may not turn profitable in the near future. Future financings

may be required to develop drugs: we anticipate two equity follow-on offerings, a $150M offering in Q4 2015 and a $200M offering in 2017.

Pipeline & Catalysts

Ultragenyx is focused on the development and commercialization of a pipeline of biologic agents as well as small molecules, for the treatment of rare disorders.

The company's four lead programs consist of:

- The FGF antibody KRN23 developed for X-linked hypophosphatemia (XLH), in Phase II testing for both pediatric and adult patients. The company aims to commence a Phase IIb study in adults in H1 2015, while a Phase II pediatric trial is ongoing.
- The recombinant human beta-glucuronidase (rhGUS) is an enzyme replacement therapy for mucopolysaccharidosis (MPS) VII. The study is currently in Phase II testing and a Phase III study is expected to commence on Q4 2014.
- Triheptanoin is a purified form of a synthetic triglyceride compound, aimed to replace metabolic intermediates in the tricarboxylic acid (TCA) cycle. The product is developed for the treatment of long-chain fatty acid oxidation disorder (LC-FAOD) and glucose transporter type-1 deficiency syndrome (Glut1 DS). It is currently in Phase II testing for both LC-FAOD and Glut1-DS.
- Extended release sialic acid (SA-ER) is an oral product developed for Hereditary Inclusion Body Myositis (HIBM), with Phase II results expected to report out in October 2014.

Figure 1: Ultragenyx's Pipeline

Product	Description	Indication	Commercial rights	Stage
Recombinant human β-glucuronidase (rhGUS, UX003)	Enzyme replacement therapy	Mucopolysaccharidosis 7 (MPS 7/Sly syndrome)	Worldwide	Phase III
KRN23 (UX023)	Anti-FGF antibody	X-linked hypophosphatemia (XLH)	Kyowa Hakko Kirin (KHK) U.S. / Canada (profit share); E.U. (royalty) Mexico, Central/South America (full rights)	Phase II
Triheptanoin (UX007)	Susbtrate replacement	Glucose transporter type-1 deficiency syndrome (Glut1 DS)	Worldwide	Phase II
Triheptanoin (UX007)	Susbtrate replacement	Long-chain fatty acid oxidation disorders (LC-FAOD)	Worldwide	Phase II
Extended-release sialic acid (SA-ER, UX001)	Susbtrate replacement	Hereditary inclusion body myopathy (HIBM)	Nobelpharma Partnership ex-Japan	Phase II
Recombinant human protein protective cathepsin-A (rhPPCA, UX004)	Enzyme replacement therapy	Galactosialidosis	Worldwide	PC

Sources: Company reports, STRH research

Figure 2: Ultragenyx's Milestones

Product	Indication	Timing	Milestone
rhGUS	Mucopolysaccharidosis 7 (MPS 7/Sly)	Q4 2014	Initiate Phase III trial
Triheptanoin	**Long-chain fatty acid oxidation disorders (LC-FAOD)**	**mid-15**	**Phase II interim data**
Triheptanoin	**Glucose transporter type-1 deficiency syndrome (Glut1 DS)**	**mid-15**	**Phase II interim data**
KRN23	X-linked hypophosphatemia (XLH)	H1 2015	Initiate Phase IIb (adult)
SA-ER	Hereditary inclusion body myopathy (HIBM)	H1 2015	Possible Phase III initation
KRN23	**X-linked hypophosphatemia (XLH)**	**Q4 2015**	**Phase II (pediatric) interim data**
rhGUS	**Mucopolysaccharidosis 7 (MPS 7/Sly)**	**Q4 2015**	**Phase III results**

Sources: Company reports, STRH research

Ultragenyx Has a Diverse Pipeline with Varying Degrees of Proof-Of-Concept

Ultragenyx has a well-diversified pipeline with four products in the clinic to treat five ultra-rare genetic, metabolic diseases: KRN23 for X-linked hypophosphatemia (XLH), triheptanoin for both long chain fatty acid oxidation disorders (LC-FAOD) and glucose transporter type-1 deficiency syndrome (Glut1 DS), recombinant human beta-glucoronidase (rhGUS) for mucopolysaccharidosis type VII (MPS VII), and finally, sialic acid extended release (SA-ER) for hereditary inclusion body myopathy (HIBM). Each of these programs is currently in Phase II, and the company has generated encouraging proof-of-concept data for each of the four assets. Ultragenyx also has a single preclinical program, recombinant human protein protective cathepsin-A (rhPPCA) for galactosialidosis.

Ultragenyx's diverse pipeline is the result of the company's portfolio strategy to drug development, which allows the company to take multiple shots on goal, all within ultra-rare metabolic genetic disorders. The targeted indications offer several advantages, including small number of patients and short timelines to potential approval, high pricing power and favorable exclusivity terms. Of the company's four clinical stage programs we believe that rhGUS has a well-understood mechanism of action and a relatively straightforward road map to regulatory approval and commercialization (though the primary endpoint is under determination with the FDA). Dr. Emil Kakkis, the Chief Executive Officer of Ultragenyx played a chief role in developing a similar enzyme replacement therapy (Aldurazyme) for the treatment of MPS I during his tenure at BioMarin. In addition, Ultragenyx plans to in-license other drug candidates with well-understood biology that will lead to rational trial design and rapid commercialization. The portfolio approach also allows for adaptive trial designs which provide a high degree of optionality to pursue therapies with promising data, and avoid investing heavily in costly trials that could be unsuccessful.

We anticipate significant newsflow from Ultragenyx, with 5+ data readouts in 2015. A Phase II study of KRN23 is ongoing in pediatric patients with XLH, and interim results are expected by 4Q 2015. Concurrently, a Phase IIb study in adult patients is expected to begin dosing in H1 2015. We forecast that this product could enter pivotal testing in late 2015/early 2016, with clinical data and regulatory submission in 2017. Following the launch of a Phase III study of rhGUS in MPS VII patients in Q4 2014, the company anticipates that results could report out in Q4 2015. Based on regulatory filings in 2017, we anticipate that the product will most likely reach the market in 2018 in the U.S. and 2019 in the E.U. Triheptanoin is being tested in two Phase II studies, in FAOD and Glut1, with interim data from both programs expected mid-2015. Thus, we assume that Phase III testing could begin in H2 2015, and the drug could reach the market in

2018. Results from a Phase II extension study of SA-ER dosed at 12g were presented at the WORLD Muscle Congress in October, and did not demonstrate a benefit over the 6g dose. Thus, we expect Ultragenyx to launch a Phase III trial at the 6g dose in 1H 2015, with the drug potentially reaching U.S and E.U. markets in 2018. Net-net, we anticipate that all Ultragenyx programs could succeed, and that rhGUS will most likely be the first-to-market in 2017, with SA-ER, KRN23 and triheptanoin in 2018.

KRN23 Has a High Likelihood of Success and a Potential $1B Market Opportunity at Peak

KRN23 is a fully human monoclonal antibody designed to bind and inhibit the activity of the FGF23 protein to treat X-linked hypophosphatemia (XLH), currently in Phase II testing.

XLH patients have abnormally low serum phosphate levels due to the inability of the kidneys to retain phosphate from the urine. This results in poor bone mineralization and several downstream clinical effects including rickets, bowing of the legs, other skeletal deformities, short stature, bone pain, increased risk of fractures, and muscle weakness. Given that these patients harbor insufficient serum phosphate, therapeutic approaches currently consist of frequent dosing of oral phosphate and vitamin D supplements. This current standard of care requires vigilant monitoring and entails a high pill burden, which can be stressful for patients.

The involvement of the FGF23 protein in the regulation of phosphate and vitamin D levels has been well described in medical literature. KRN23 has a clean mechanism of action by means of binding and antagonizing FGF23. Phase I data suggest that a single dose of KRN23 can safely increase phosphate levels.

KRN23 is subject to a collaboration agreement between Ultragenyx and Kyowa Hakko Kirin (KHK), and Ultragenyx recognizes approximately a third of product revenue. The asset is currently in Phase I/II testing in adult patients with XLH, with a Phase IIb study slated to begin in H1 2015. A pediatric Phase II trial is ongoing, and interim data are anticipated by year end 2015.

We estimate that there are approximately 9,000 adult and 3,000 pediatric XLH patients in the U.S. The pediatric population is likely more severe, with greater motivation to begin therapy. Our base case scenario assumes a 75% probability of success, and we anticipate that this therapy will most likely reach a high penetration into the pediatric XLH market. We take a conservative approach, however, when estimating peak penetration rates (43%, 33%, and 11% in the pediatric population in the U.S./Canada, E.U. and Latin America, respectively,

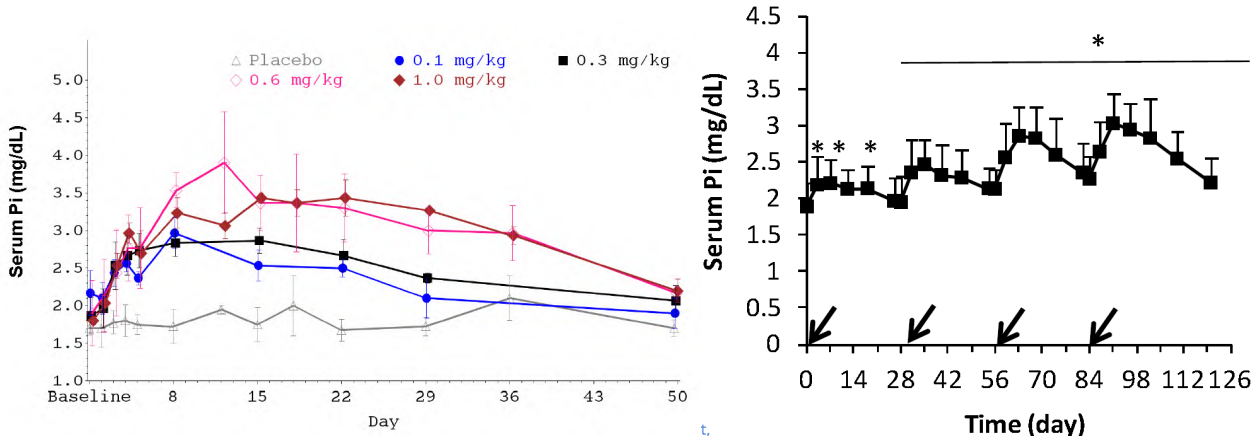
and 18%, 15%, and 5% penetration in the adult population), given the existing therapies (oral calcium and vitamin D), potential competitors and underdiagnosis. We forecast peak revenue of $952M in 2028, which translates into $306M to Ultragenyx.

Ultragenyx is eligible for ~1/3 of worldwide KRN23 revenue, based on a licensing deal with Kyowa Hakko Kirin (KHK). Ultragenyx has a complicated licensing agreement in place with KHK wherein the company is eligible to receive approximately 33% of KRN23 revenue. Clinical development costs are shared 50/50. In the U.S. and Canada, Ultragenyx will be responsible for launching the drug, while KHK will book sales and Ultragenyx is eligible to receive 50% of the profit for the first 5 years, and a 20% royalty on revenue thereafter. In the E.U., KHK will commercialize and sell the drug, and will pay a 10% royalty to Ultragenyx. In Latin America, Ultragenyx will commercialize the drug and book sales while paying a low single-digit royalty to KHK. This arrangement allows Ultragenyx to build their commercial sales force in the U.S. and Latin America, setting up infrastructure for future therapeutics in ultra-rare disorders. KHK benefits from Ultragenyx's expertise in developing ultra-rare drugs and insights in metabolic bone diseases.

Data from Phase I and Phase II trials demonstrate that KRN23 can increase serum phosphate levels in adults. KRN23 has demonstrated efficacy in a 16-month Phase I/II trial in 28 patients, where KRN23 increased serum phosphate (Pi) upon administration of a single dose (Figure 3, left panel), over a period of 4 months with once monthly dosing (Figure 3, right panel), and over 16 months at once monthly dosing (0.1 - 1.0 mg/kg based on a dose-escalation algorithm) in the 12-month extension phase (Figure 4). Subjects entered the trial with baseline serum Pi of 1.9 at the beginning of both the dose escalation and extension phases (pre-dose). For comparison, healthy normal serum phosphate levels are 3.0 mg/dL – 4.5 mg/dL. Serum Pi did not exceed 4.5 mg/dL in any patient, indicating that KRN23's pharmacokinetic profile may be smooth enough to enable a therapeutic window allowing for maintenance of serum Pi within the normal target range.

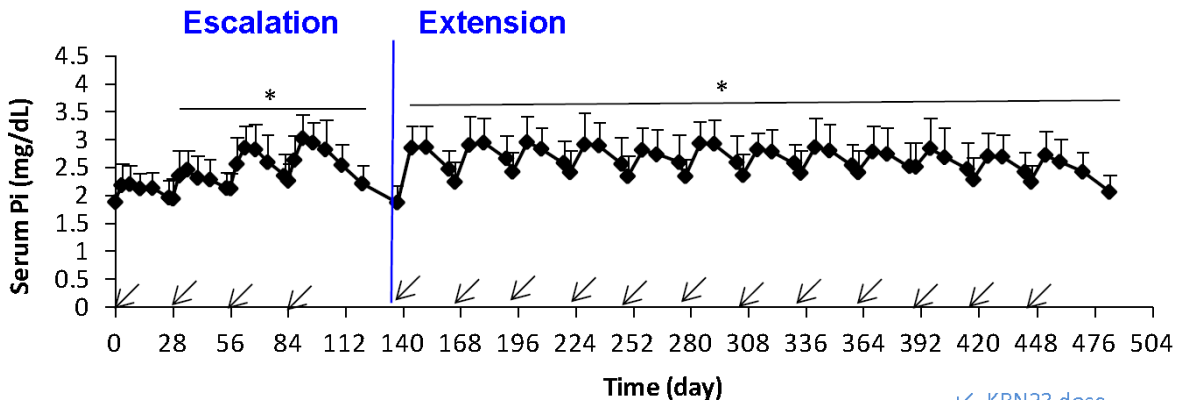
Our physician consultants believe that the FDA will likely want to see a clear effect on bone formation via X-ray or another imaging modality, for KRN23 to be granted Accelerated Approval. We view the serum Pi marker as promising because the etiology of the disease is believed to result only from the lack of Pi raw material availability required to build new bone. We note that KRN23 has not yet demonstrated effects on bone formation, but the results of a Phase II study in pediatric patients could shed more light into the efficacy of this product with respect to bone development.

Figure 3: KRN23 Demonstrates Increases in Serum Phosphate (Pi) with One Dose and Over 4 Months At 1x/Monthly Dosing



Source: Imel et al., 2014 ENDO/ICE Meeting

Figure 4: KRN23 Demonstrates Increases in Serum Phosphate (Pi) with Once-Monthly Dosing Over 16 Months



Source: Carpenter et al., 2014, ASBMR Meeting

KRN23 also demonstrated improvements in patient reported outcomes on two different scales: SF-36v2 and WOMAC, with the caveat that the trial was open-label. Post the first four months of dosing in the Phase I/II trial, KRN23 demonstrated statistically significant benefits (Figure 5, Figure 6) on several scores within two different patient reported outcome (PRO) surveys, the Short Form-36v3 Health Survey (SF-36v2) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

Although we are encouraged by the effect of KRN23 on PRO scales, unfortunately none of the statistically significant results were replicated upon correcting for the multiplicity of several statistical tests performed on the data,

except for one, the Role Limitations Due to Physical Health score (RP). With a greater number of patients, the trial may have hit statistical significance given the trend observed across most of the individual elements of the score. Our enthusiasm is tempered by the unblinded nature of the data. In our view, it is difficult to have conviction when evaluating unblinded PRO data due to the possibility of a placebo effect.

Figure 5: KRN23 Demonstrates Improvements on Several Scores within the SF-36v2 and WOMAC PRO Surveys

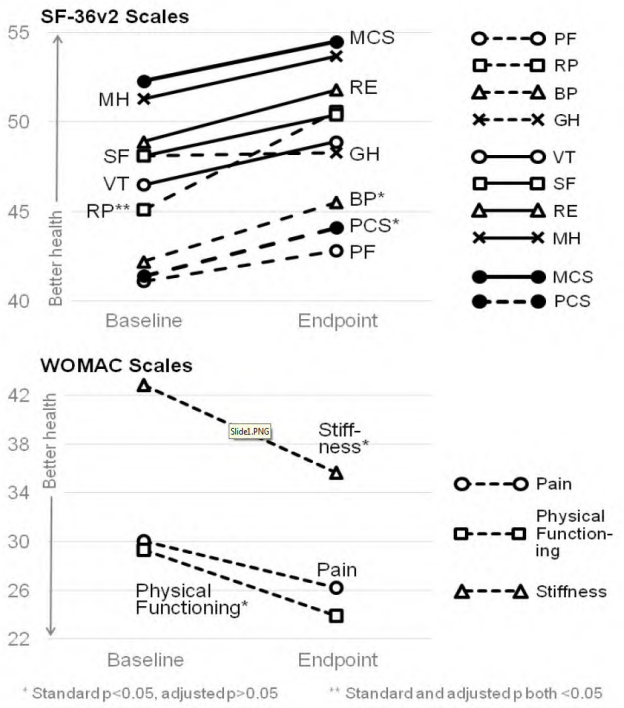


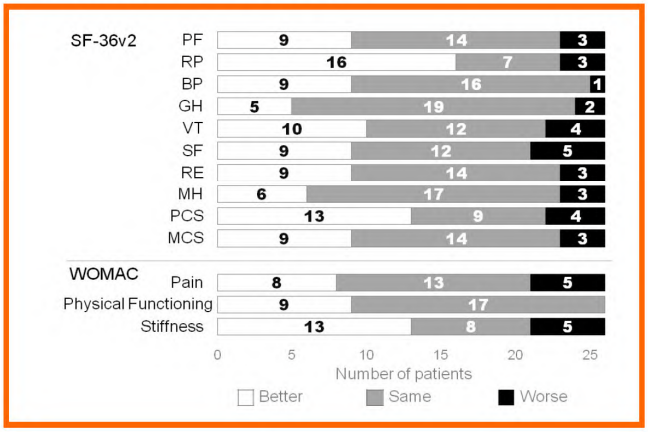
Table 1. SF-36v2 Scales

	Acronym	n*
Physical Functioning	PF	10
Role Limitations due to Physical Health	RP	4
Bodily Pain	BP	2
General Health Perceptions	GH	5
Vitality	VT	4
Social Functioning	SF	2
Role Limitations due to Emotional Problems	RE	3
Mental Health	MH	5

Source: Ruppe et al., 2014, ICE/ENDO Meeting
Note: A higher score on SF-36v2, but a lower score on the WOMAC scale indicates superior health.

Figure 6: Most Patients on KRN23 Improved on Two PRO Scales.

Figure 2. Number of Patients Better, Same or Worse by Endpoint (n=26)



Source: Ruppe et al., 2014, ICE/ENDO Meeting
Note: These data were not placebo-controlled, and should be interpreted with care.

XLH adult patients present with wide range of disease severity. Using data from the extension portion of the Phase I/II trial of KRN23 in 28 patients, investigators compared the burden of disease (measured by PRO) for XLH patients to the general population, an asthma patient historical cohort, and an osteoarthritis historical cohort (Figure 7, Figure 8). Disease burden scores for XLH patients were below the U.S. population norm for mean Bodily Pain, Physical Functioning, Role Limitations due to Physical Health, and the Physical Composite Score. Other scores were not significantly worse at baseline. Several XLH patients displayed better relative health than asthma patients, both at baseline and after treatment (Figure 7). At baseline, XLH patients in this trial appeared to have similar/better relative average health compared to a control osteoarthritis population. Our physician consultants noted that ~50% of their XLH patients are on the standard of care (SOC), oral phosphate + activated vitamin D (Cacitriol). About 50% of patients do not take phosphate + Calcitriol due the high degree of inconvenience and pill burden, and likely because their disease is not severe.

If KRN23 were available today, our consultants believe they would immediately switch all patients from SOC to the drug. It is less clear whether the 50% of milder patients not currently on SOC could be addressed by KRN23. While those patients might benefit, they may not be motivated to pursue treatment due to lack of disease severity.

Figure 7: Disease Burden Comparison Between XLH Patients and The General U.S. and Asthma Population

Figure 3. Burden of Disease Compared to a General US Population

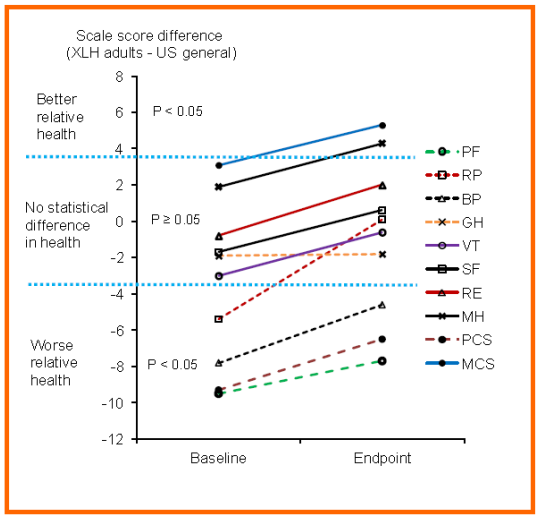
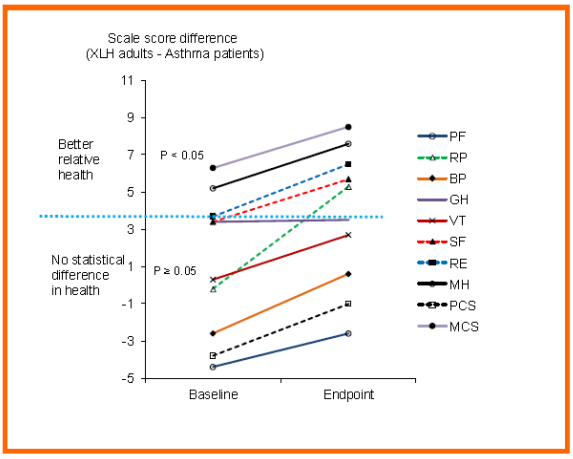


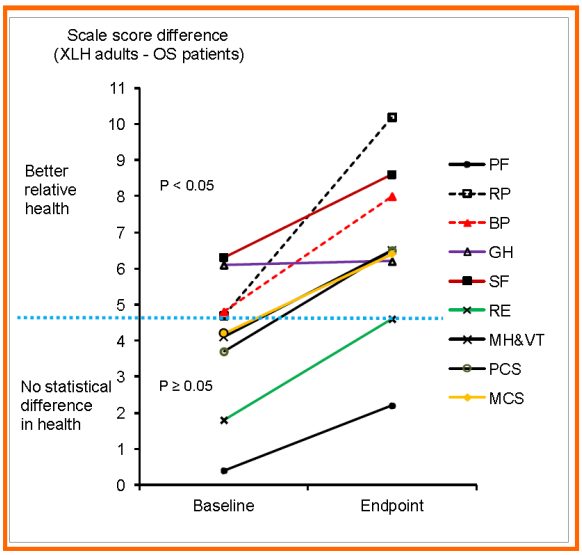
Figure 4. Burden of Disease Compared to a General Asthma Population



Source: Ruppe et al., 2014, ICE/ENDO Meeting

Figure 8: At Baseline, XLH Patients Tested Appear in Similar/Better Relative Health Compared to a Control Osteoarthritis Population

Figure 5. Burden of Disease Compared to a General Osteoarthritis Population



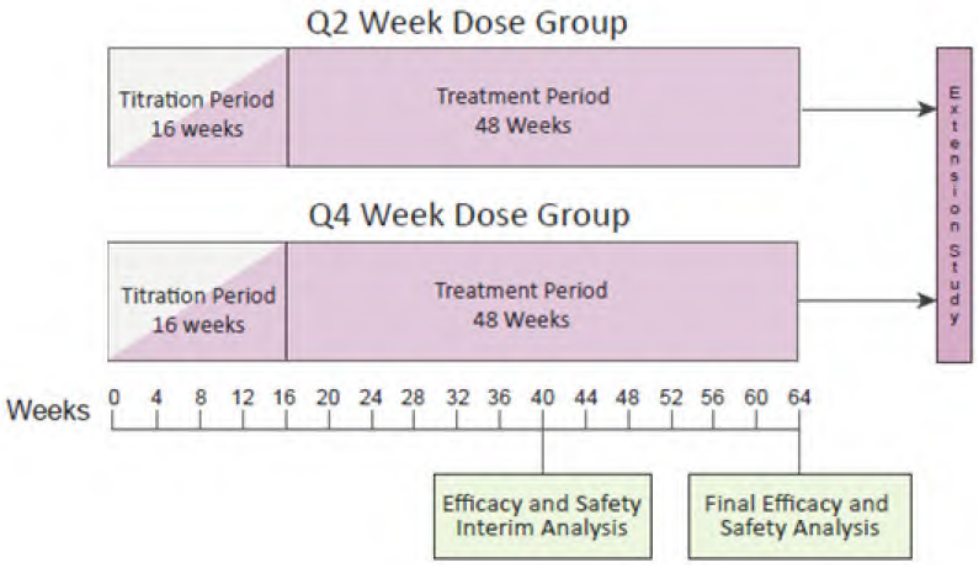
Source: Ruppe et al., 2014, ICE/ENDO Meeting

Physicians believe KRN23 will be used in virtually all pediatric and >50% of adult patients. Our physician consultants were optimistic about KRN23's mechanism of action, clinical benefit, and commercial prospects. Their view was

that increases in serum phosphate seen in the Phase I/II trial will translate into clinically meaningful improvements in bone formation and quality of life. They are largely unsatisfied with the current standard of care, oral phosphate and Calcitriol, which they say tastes terrible (kids hate it), has a high pill burden (up to 20 pills/day), and is only efficacious in mild patients (<50% of adults). They were satisfied with the safety profile, and estimated that they would use KRN23 immediately in essentially all of their pediatric patients, and >50% of their adult patients (all of those who are severe enough to go on phosphate + Calcitriol). They also suggested that the disease is often misdiagnosed as rickets, and it can take some time for patients to receive a correct diagnosis and get started on therapy. However, this process could become less protracted should a more effective drug be approved.

The path forward: Phase II pediatric study initiated in July 2014. Ultragenyx has chosen to focus the development of KRN23 in the near term on pediatric patients given they represent a higher unmet need than adults; the latter typically present with clinically milder disease. The goal of the Phase II UX023-CL201 trial will be to establish a dose level and regimen mostly likely to lead to the greatest benefit/risk profile. In the trial, we expect Ultragenyx to obtain measurements of bone disease that will enable true proof-of-concept to garner greater confidence in the efficacy and safety of KRN23 in pediatric XLH patients. The trial will enroll 30 patients between the ages of 5-12 years old across 9 sites in the U.S. and E.U. KRN23 will be dosed once every 4 weeks via subcutaneous injection as in the previous adult trials. Contingent on a positive result in Phase II, Ultragenyx will design and conduct a Phase III pediatric study. Additionally, Ultragenyx will conduct a parallel Phase IIb study in the adult XLH population.

Figure 9: Ultragenyx Will Pursue the Pediatric XLH Population with KRN23



Source: Company reports

We model for KRN23 peak revenue of $953M in 2028, corresponding to $306M to Ultragenyx. Interim data from the Phase II pediatric trial of KRN23 in XLH are expected in Q4 2015. We estimate that there are approximately 9,000 adult and 3,000 pediatric XLH patients in the U.S. The pediatric population is likely more severe with greater motivation to begin therapy. Thus, we model for peak penetration at 17% into the adult and 38% into the pediatric population in the U.S., 14% and 31% in the E.U, and 4% and 9% in the ROW. We assume an initial price of $100K, leading to peak revenue of $953M in 2028. We note that Ultragenyx owns ~1/3 of the economics of the drug, thereby we forecast KRN23 peak revenue of $306M.

rhGUS for MPS VII Has a High Probability of Success but Addresses a Small Market

rhGUS is an enzyme replacement therapy (ERT) for mucopolysaccharidosis type VII (MPS VII). Ultragenyx retains the rights to rhGUS, and the product is in Phase I/II testing, with a Phase III study expected to launch in Q4 2014.

MPS VII is a lysosomal storage disease (LSD) similar to the other LSDs that are currently treated by enzyme replacement therapies (e.g. Naglazyme for MPS VI, Aldurazyme for MPS I, VIMIZIM from MPS IV, and Elaprase for MPS II). In MPS VII, a deficiency of the lysosomal enzyme beta-glucoronidase leads to storage and accumulation of glycosaminoglycans (GAGs) in a wide variety of cells types

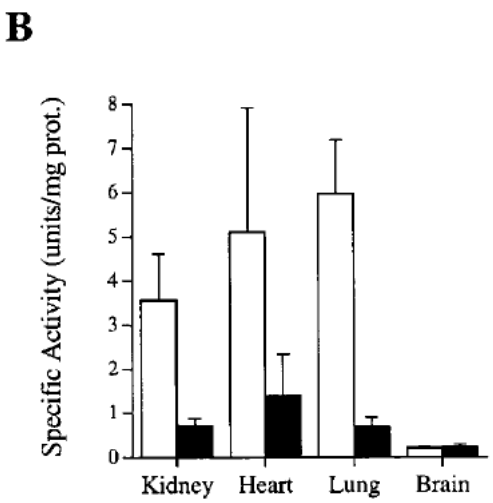
throughout the body. The most prominent symptoms are enlarged liver/spleen, pulmonary symptoms, joint stiffness, and short stature. Patients also have reduced lifespan, at an average of ~30 years. Diagnosis of the disease is similar to the other MPS disorders, where enzymatic assays for the missing protein or genetic testing provide definite evidence for the root cause of the disease.

Preclinical data suggest that rhGUS is incorporated into cells, a rate-limiting step for appropriate functioning. We view the chance of success of rhGUS as high as it is an ERT that replaces a missing enzyme for these patients, similar to the several ERTs that have been successfully developed and commercialized.

Physicians we spoke with noted their enthusiasm for a novel treatment for MPS VII, given the lack of acceptable treatment options and limited life expectancy (15-20 years, severe disease typically results in death during infant stages). They noted the "pretty impressive" data generated in preclinical models (mice and dogs). We estimate that there are approximately 200 MPS VII patients worldwide. Thus, we model for peak penetration of 94% in the U.S. and 82% in the rest of the world. We assume an annual price of $400K, translating into worldwide peak revenue of $73M in 2028.

Extensive preclinical data demonstrate solid PK and efficacy. Preclinical data from experiments using the rhGUS enzyme have shown that it is able to penetrate a wide variety of tissues and degrade GAGs in those tissues in mice (Figure 10). The predictive ability of preclinical experiments for human clinical trials has been strong for several MPS disorders, which leads us to believe that rhGUS has a high chance of success at demonstrating efficacy in humans.

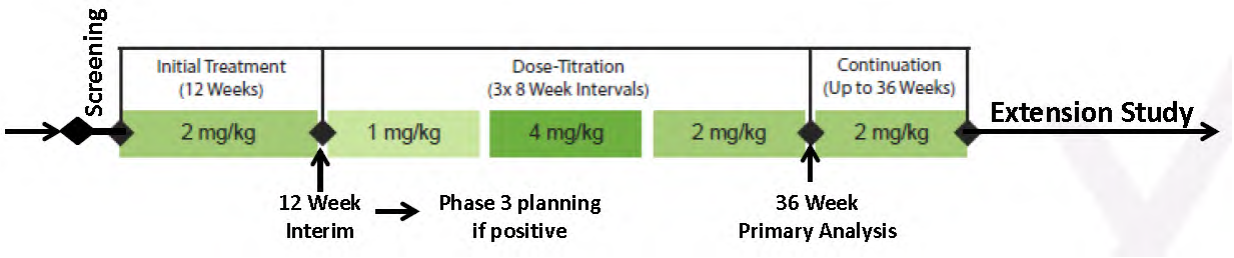
Figure 10: Preclinical Experiments in MPS VII Mice Demonstrate at Least Some Beta-glucoronidase Enters a Variety of Tissues.



Source: Sands et al. 2001, Journal of Biological Chemistry
Note: Open Bars Represent Phosphorylated Protein, While Filled Bars Are Un-phosphorylated.

Phase I/II data demonstrated efficacy on the primary endpoint of uGAG reduction. As of the latest data release (September 3rd, 2014), the initial Phase I/II trial of rhGUS in MPS VII pediatric patients had enrolled 3 patients with a diagnosis of MPS VII confirmed by both an enzymatic assay for beta-glucuronidase and genetic sequencing, and uGAG (urinary glycosaminoglycans) excretion greater than 2-fold over normal. Dosing was by IV infusion every 2 weeks at 2 mg/kg for 12 weeks, then three 8-week intervals at 1 mg/kg, 4 mg/kg, and 2 mg/kg (Figure 11). After the variable dose titration, there was an extension period of 36 weeks at 2 mg/kg. The primary endpoint was mean decrease from baseline in uGAG after the dose titration (after 36 weeks on varying doses of rhGUS).

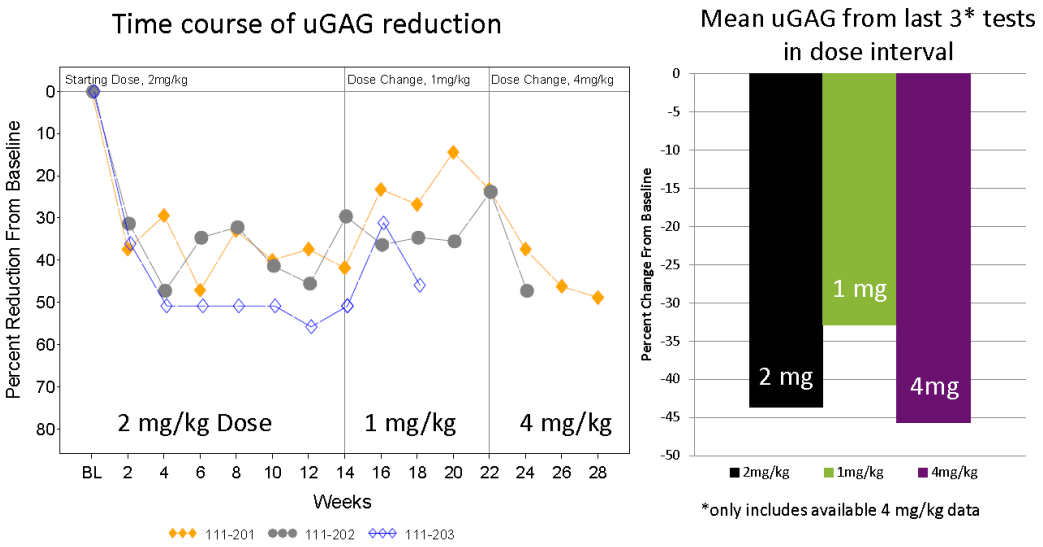
Figure 11: rhGUS Phase I/II Trial Design



Source: Company reports

After 12 weeks of treatment, patients experienced a reduction of ~40% in uGAGs. At the data cut-off, 1 patient had made it all the way to 24 weeks with a ~50% reduction in uGAGs (Figure 12). In our view, it is promising that these reductions in uGAG were seen in the trial, and especially promising that the uGAG seems to correlate in a dose-dependent manner. However, we note the outstanding risk from uncertainty about the organ system from which these uGAGs originate. In the most optimistic case, the enzyme penetrates the lysosomal compartments of cells within all tissues where accumulation is happening and degrades the GAGs throughout the liver, spleen, heart, lung and brain. In a pessimistic case, the uGAGs at baseline come only from the distal renal tubule. In this latter case, rhGUS treatment would be degrading ~50% of the GAGs flowing out through the urine, but have no meaningful impact on levels in less penetrable areas such as the lung and brain. This may have a large impact on the level of clinical benefit delivered by rhGUS. This risk is further buttressed by a lack of clinical benefit seen via the 6 minute walk test (6MWT) or pulmonary endpoints. We note that the study was not powered to assess these endpoints, with only 3 patients and not-yet-mature follow-up. While we would like to see a randomized, placebo-controlled Phase III with an endpoint such as 6MWT or FVC for a definitive answer to these questions, although this may not be possible in a disease as rare as MPS VII.

Figure 12: rhGUS Demonstrates the Ability to Decrease uGAG Levels Via Intra-Patient Dose-Response



Source: Company reports

Physicians are positive on rhGUS due to its robust effect on uGAG, clean mechanism of action, and similarity to other ERTs. Physicians came across as almost frustrated with the lack of treatment options for MPS VII, a disorder in which patients have severely reduce life spans (average 15-20 years). This frustration is stimulated by the availability of ERT therapy for other MPS disorders that were more attractive to commercialize due to higher numbers of patients (200 worldwide for MPS VII versus 1000 and 3000 for MPS VI and MPS IV, respectively). Our consultants were impressed with the effect of rhGUS on the common disease biomarker used in MPS disorders, uGAG, across multiple animal species and in humans in the Phase I/II trial. One physician noted that the reductions in liver and spleen size were "pretty impressive," and would be expected to improve breathing status as measured by FVC and the 6MWT.

Ultragenyx plans to initiate a Phase III blind-start trial in Q4 with two primary endpoints (including uGAG) for its worldwide registration strategy. Ultragenyx is initiating a Phase III pivotal trial that is randomized with a double-blind start in the U.S. at a dose of 2 mg/kg every other week. The company has stated that the European Medicines Agency (EMA) has agreed to a protocol involving a 12-patient study with the uGAG as the primary endpoint. We believe the company has not reached a definitive conclusion with the FDA on the second primary endpoint (given they will not accept uGAG). The company is investigating the use of an Individualized Clinical Response (ICR) score that could be unique for each patient based on their own manifestations of disease. Patient surveys are underway to determine how the ICR might work. While we expect regulatory agencies to work with Ultragenyx to design rational endpoints

for trials in diseases with so few patients, there may be significant regulatory risk associated with a Phase III pivotal trial endpoint (uGAG reduction) that may not provide sufficient evidence of clinical benefit to the FDA. We await further clarity of the clinical endpoints that could be acceptable in the U.S. as the company discusses the Phase III trial design with the FDA. We note that the VIMIZIM advisory committee panel on November 13, 2014 may indicate that the FDA is becoming more focused on requiring demonstrations of clinical benefit in trials of ultra-rare disorders. On the other hand, Ultragenyx may have a valid rationale for using the accelerated approval pathway to approve rhGUS based on the uGAG endpoint because the disease has 1) only 200 patients worldwide (thus it is likely impossible to power a more clinically-relevant endpoint such as 6MWT or FVC), 2) a clinically heterogeneous presentation, with patients' disease manifesting in different ways, thus possibly making clinical endpoints not comparable patient-to-patient. A well-developed ICR endpoint could address both of the issues.

We model for rhGUS peak revenue of $68M in 2026. Ultragenyx expects data from the Phase III trial in 4Q 2015, supporting approval and commercialization in 2017. We estimate that there are approximately 200 MPS VII patients worldwide. Thus, we model for peak penetration at 93% in the U.S, and 79% in the E.U. We assume an annual price of $400K, leading to peak revenue of $73M in 2028.

Triheptanoin Could Be the Greatest Value Driver with LC-FAOD and Glut1 DS

Triheptanoin is a purified form of a synthetic triglyceride compound, aimed at replacing intermediate metabolites in the tricarboxylic acid cycle (also known as the Krebs cycle, a basic process in cellular metabolism). Triheptanoin thus replaces medium-length, odd-chain fatty acids. The product is currently in two Phase II trials, for two genetic rare disorders in which patients are unable to metabolize fat into useful energy.

Long chain fatty acid oxidation disorder (LC-FAOD) encompasses genetic defects in a mitochondrial enzyme, that prevent patients from storing and producing sufficient glucose (sugars) for tissues such as muscle, heart, and liver to function properly. Chronic glucose depletion results in significant morbidity such as muscle rupture and heart failure, and even death. However, there appears to be a broad range of disease outcomes, and therefore measures of clinical benefit occupy a broad spectrum (discussed below). Glut1 DS (or De Vivo disease) on the other hand results from a mutation in the glucose transporter that ensures the brain obtains sufficient levels of sugar; thus the disease is characterized by developmental delay and seizures. Glut1 DS is likely underdiagnosed, given that physicians would have to perform a spinal tap and measure glucose levels in the cerebrospinal fluid (CSF).

Supporting clinical evidence for the development in LC-FAOD stems from a number of historical case studies, mostly through compassionate use. Ultragenyx is conducting a Phase II trial of triheptanoin in LC-FAOD patients, and a Phase II trial in Glut1 DS with interim results from both trials expected in 2015.

Ultragenyx retained the rights for this product, and we assign it a 60% probability of success, blended for both indications. We assume worldwide prevalence of LC-FAOD of ~15K, $75K price per patient per annum, and peak penetration of 25%, 24%, and 19% in LC-FAOD the U.S., and the E.U. , and rest of the world, respectively, in 2028. For Glut1 DS we estimate a worldwide prevalence of ~25K patients, peak penetration of 30%, 26%, and 20% in the U.S., the E.U., and rest of the world. Thus, we arrive at our peak estimates of $610M for triheptanoin worldwide peak revenue in 2028.

Triheptanoin has a long but convoluted history of use in LC-FAOD. First, there has been confusion in the past about whether triheptanoin should be developed as a pharmaceutical product, medical food, or dietary supplement. Second, while triheptanoin has been tested clinically for over 13 years in ~130 patients, including ~60 with long chain fatty acid oxidation disorders (LC-FAOD), all of the studies were uncontrolled, and mostly consist of case reporting. Finally, the clinical pathway (and the primary endpoint) by which this product might be developed is uncertain. Triheptanoin's benefit has been quantified based on reductions in hospitalizations in the past but this is a difficult endpoint to power correctly in a trial with a small number of patients. To date, there have been several investigator-sponsored anecdotal reports that have used food-grade triheptanoin to treat LC-FAOD, but there have been no published studies yet. We think Ultragenyx has solved the first issue of drug versus medical food/supplement. We view this as predominantly an IP issue, and review this controversy in the intellectual property section below.

LC-FAOD are heterogeneous and caused by genetic defects in fat metabolism. LC-FAOD are a heterogeneous group of metabolic disorders characterized by the inability to turn fat into energy, leading to the depletion of glucose (sugars) in various tissues including muscle, heart, and liver. When these tissues run out of glucose, they cannot function properly, which can cause significant morbidity and death. These patients must take great care to eat sufficient carbohydrates to make sure the patient does not develop low blood glucose that can lead to syncope (fainting). The therapeutic diet consists of high carbohydrate and low fat content. It can be difficult for these patients to be aware of how much glucose they have eaten, and to avoid fasting. The prognosis for these patients is highly variable, with some patients dying within the first year of life from their condition, and others who may never develop symptoms. It is difficult to know the proportion of patients who are symptomatic. From the previous literature, we estimate this proportion is at ~50+%. This wide variability

of severity was demonstrated by a retrospective analysis of 75 patients across 18 metabolic centers in Germany (Figure 13). In this paper, several LC-FAOD subtypes had cohorts of patients who were asymptomatic for up to 7 years after diagnosis via neonatal screening (very long-chain acyl-CoA dehydrogenase deficiency, or VLCAD). Other subtypes have high rates of death in infancy: (long chain 3-ketoacyl-CoA thiolase deficiency or LKAT; mitochondrial trifunctional protein deficiency, or TFP). Ultragenyx is enrolling patients from four of these subtypes in their Phase II trial: VLCAD, LCHAD (long chain 3-hydroxyacyl-CoA dehydrogenase deficiency), TFP and CPT 2 (carnitine palmitoyl-CoA transferase II). In our view, this variability presents a substantial challenge to designing a clinical trial that would test the efficacy of a drug in this population.

Figure 13: The Prognosis For LC-FAOD Patients Is Highly Variable

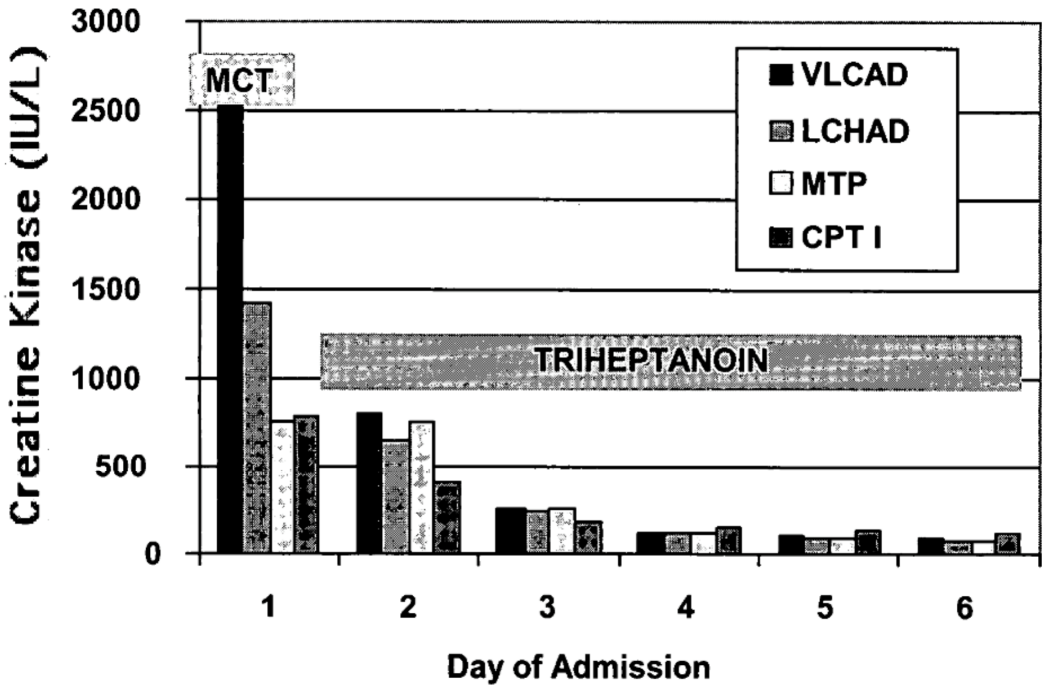
LC-FAOD Subtype	Total Patients	Patients found by newborn screening	Asymptomatic at diagnosis		Became symptomatic during follow-up	
			Number	%	Number	%
VLCAD	32	20	17/20	85%	0/17*	0%
LCHAD	27	7	4/7	57%	1/4**	25%
LKAT	1	1	0/1	0%	0	0%
TFP	10	3	0/3	0%	0	0%
CPT 2	5	3	2/3	67%	1/2***	50%
Total	75	34	23/34	68%	2/23	9%

*Duration of follow-up for VLCAD was 7 years of age
**Duration of follow-up for LCHAD was 2 years of age
***Duration of follow-up for CPT 2 was 5 years of age

Source: Spiekerkoetter et al., 2009, Journal of Inherited Metabolic Disorders

Previous clinical data is a collection of case reports showing triheptanoin reduces rates of rhabdomyolysis, hospitalizations, and deaths. Clinical data demonstrating triheptanoin's benefit come from usage of the medical food product by several investigators over the past 13 years in over 60 patients with LC-FAODs. Triheptanoin appeared to resolve one patient's rhabdomyolysis (muscle cells bursting open, often releasing clots than can cause stroke) after 2-3 days of treatment as measured by creatine kinase activity (Figure 14, Figure 16). Triheptanoin likely provides an alternative energy source that can be used by muscle in situations where muscle glycogen has been depleted. This provides a strong rationale by which replacement fuel that can be used by muscle would rescue rhabdomyolysis. Triheptanoin also showed a demonstrable benefit on patient mortality and hospitalizations across several types of FAOD (Figure 15, Figure 16, Figure 17).

Figure 14: Triheptanoin Appears to Rescue Patient from Acute Rhabdomyolysis (Measured By Creatine Kinase Activity)



Sources: U.S. Patents #8,106,093 & #8,697,748

Figure 15: Triheptanoin Reduces Rate Of Death In A Variety Of LC-FAOD Subtypes

Diet:	Conventional	Triheptanoin
Total Patients	41	48
% of patients withdrawing	51%	6%
FOD Disorder Subtype	Patient Mortality Rate	
CACT	5/5 - 100%	1/1 - 100%*
CPT II	4/5 - 80%	No patients
VLCAD	6/8 - 75%	1/19 - 5%
TFP	4/4 - 100%	1/5 - 0%
LCHAD	2/10 - 20%	0/9 - 0%

Source: U.S. Patent #8,697,748; STRH Research

Ultragenyx has begun a Phase II trial in four LC-FAOD subtypes with interim data expected in mid- 2015. Ultragenyx has initiated an open-label Phase II trial that will enroll 30 patients from four LC-FAOD subtypes (VLCAD, LCHAD, TFP

and CPT 2) across 7 sites in the U.S. Patients will be subject to a 4-week run in period, followed by treatment for 24 weeks, when the first primary analysis will take place, for which we expect data in mid-2015. After the treatment period, patients will enter an extension period for longer term follow-up. The second primary analysis will take place at 78 weeks (1.5 years).

While data from a previous literature review conducted by Ultragenyx appears to suggest that triheptanoin can reduce rates of hospitalization, these data may suffer from a reporting bias. At a recent conference, management noted that reducing the number of hospitalizations per year is a challenging endpoint to hit due to high variability and long timelines. There are several factors that could influence that rate, including subjective physician decision-making that may not be consistent between doctors and sites. The differences between the subtypes of this heterogeneous group of diseases to be studied may result in noisy hospitalization rates. Even if the drug has a relatively robust effect, it may be difficult to detect in a trial setting over the course of 1.5 years. While the clinical endpoints in this Phase II may face some uncertainty, Ultragenyx is planning to explore several secondary endpoints, including measures of exercise physiology, including muscle strength and a twelve-minute walk test. This exploration of possible endpoints could result in Ultragenyx gaining the clinical experience with the LC-FAODs to enable a well-powered pivotal Phase III trial.

Figure 16: Triheptanoin Appears to Benefit Rates of Rhabdomyolysis and Hospitalization in a Historical Literature Review

Description	Pre-treatment	Post-treatment	% decrease	n	p-value
Mean total hospitalizations/year[1]	1.94	1.26	36%	16	0.1126
Mean total hospital days/year[1],[2]	17.55	5.4	69%	15	0.0242
Mean infant total hospitalizations/year[3]	13.01	1.37	89%	4	0.0892
Mean hypoglycemia events/year[1],[4]	0.92	0.04	96%	9	0.0091
Mean hypoglycemia total hospital days/year[1],[2],[4]	8.42	0.18	98%	9	0.0257
Mean rhabdomyolysis events/year[1],[5]	1.05	0.68	35%	11	0.4604
Mean rhabdomyolysis total hospital days/year[1],[5]	5.94	2.16	64%	9	0.1224
Mean peak creatine kinase (units) for rhabdomyolysis events[1],[5]	85,855	25,797	68%	7	0.1279

(1) Excludes data for four infants dosed within first six months of life.

(2) Excludes hospitalizations with unknown discharge dates.

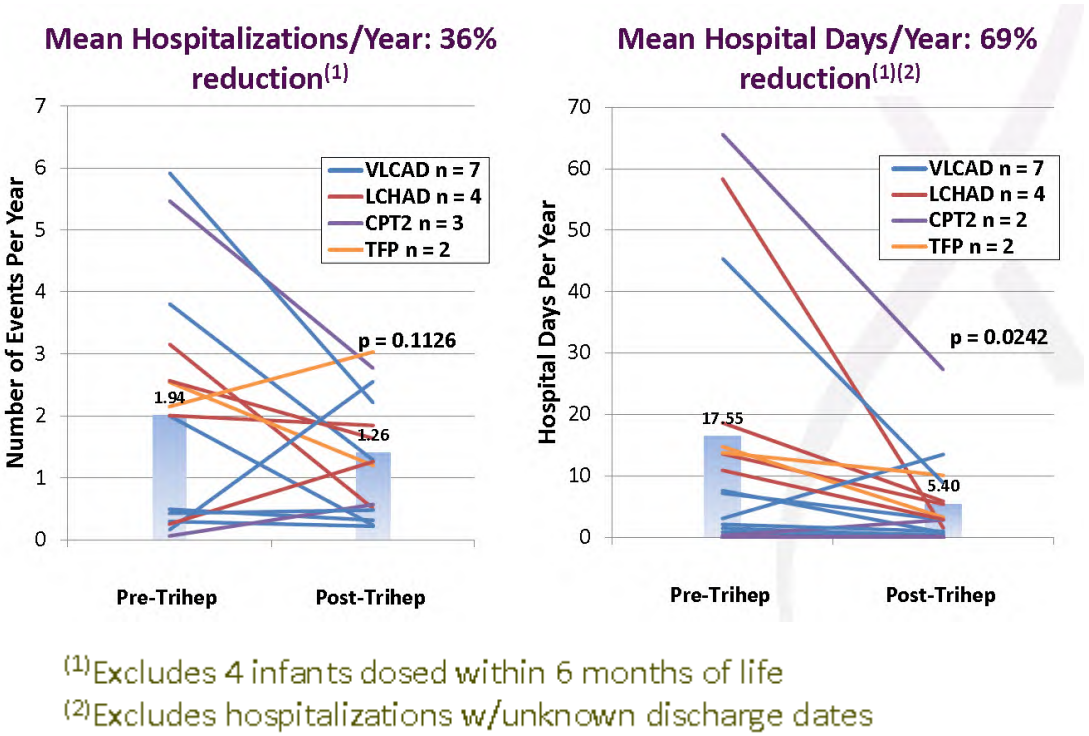
(3) Four infants were dosed within the first six months of life.

(4) Includes only those patients with hypoglycemia events prior to treatment.

(5) Includes only those patients with rhabdomyolysis events prior to treatment.

Source: Company reports

Figure 17: Triheptanoin Appears to Reduce Hospitalizations and Days in Hospital Per Year

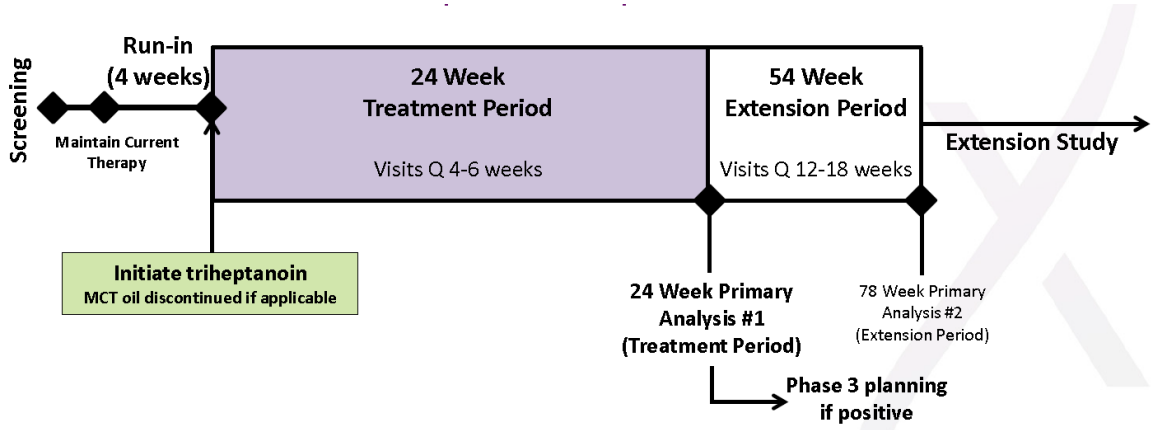


(1)Excludes 4 infants dosed within 6 months of life
(2)Excludes hospitalizations w/unknown discharge dates

Source: Company reports

Many physicians already use food-grade triheptanoin in patients, and look to controlled data with a pharmaceutical version to drive adoption. Our physician consultants view the numerous case histories of LC-FAOD patients on triheptanoin as promising, but say that they look forward to well-controlled data from a clinical trial setting to convince them of efficacy. They are well satisfied with the safety due to the extensive clinical history with the medical food version of the product, and some currently use it in 10-20% of their patients. They noted that they typically treat patients for a trial period of 3-6 months to assess the benefit before deciding to keep the patient on triheptanoin long-term. Thus, they are satisfied with the design of the Phase II that will treat 30 patients for 6 months and assess outcomes via hospitalization rates and several other exploratory outcomes that they find meaningful, including ultrasounds, exercise tolerance and muscle strength, as well as biomarkers such as liver function tests. They also believe the disease is underdiagnosed, but note that efforts are ramping up in the E.U., and especially in Germany, to create registries. While they view gene therapy as a theoretical competitor, they were not aware of any significant active programs.

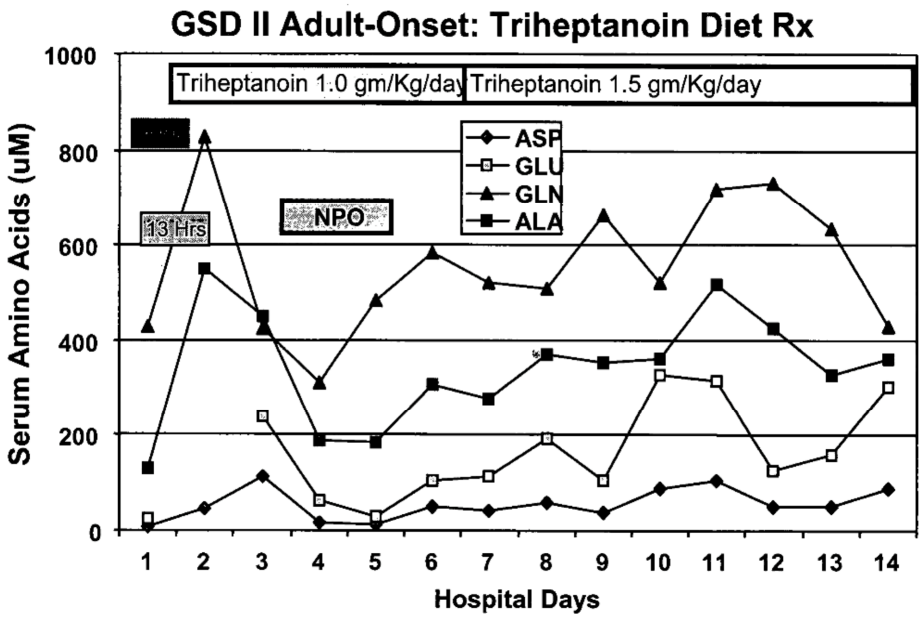
Figure 18: Phase II Trial Design of Triheptanoin in LC-FAODs (Study UX007-CL201)



Source: Company reports

Triheptanoin shows promise in Pompe's patients by normalizing amino acids and improving QoL. We dug into the patent literature to find that triheptanoin has been used to treat at least 2 human patients with adult-onset Pompe's disease and in horses with polysaccharide storage disorders. Additionally, there are several academic clinicians interested in using the drug to treat a wide range of disorders including autism, Huntington's and Alzheimer's disease. The first Pompe patient was a 42 year-old female with progressive muscle weakness and improper lung function. Her lungs deteriorated such that she could not breathe, leading to emergency hospitalization and the use of a mechanical ventilator (an "iron lung") to enable her to receive enough oxygen. While hospitalized, she agreed to enter into an experimental protocol whereby she would be treated with triheptanoin (as 26% of her daily caloric intake). Within 13 hours of beginning the diet, serum amino acid levels normalized (Figure 19). The patient was taken off of mechanical ventilation after ~3 weeks. After she was discharged from the hospital, she continued to consume triheptanoin, and her quality of life was greatly improved. She returned to work after 5 weeks, and was working full-time by 10 weeks. This patient's experience provides a rationale for the use of triheptanoin to be used as a source of energy in patients with compromised metabolism.

Figure 19: Triheptanoin Normalizes Blood Amino Acid Levels in a Pompe Patient



Source: U.S. Patent #8,697,748

In the second Pompe patient, a 66 year-old male with a clinical history of progressive muscle weakness (used a scooter to move around for the past 10 years), decided to try triheptanoin diet therapy (as 22% of his daily caloric intake) on an experimental basis under the supervision of his physicians, combined with intensive physical therapy. Before the experiment, the patient required assistance with grooming, dressing, bathing, going to the bathroom, and walking. After, he became independent with grooming, dressing, and going to the bathroom, and could wheel himself in a wheelchair. The patient continued on triheptanoin diet therapy. The experiences of these 2 Pompe patients, while exciting, should be interpreted with caution. They are uncontrolled, and there is no way to definitively know if triheptanoin, or some other aspect of their critical care resulted in the improvements they demonstrated.

Ultragenyx's pharmaceutical grade triheptanoin (UX007) is not a medical food, and IP protection will likely prevent medical food/supplement entrants until 2025, in our view. According to the FDA Draft Guidance (issued May 2007, updated August 2013), medical foods are defined as "a food which is formulated to be consumed or administered enterally under the supervision of a physician and which is intended for the specific dietary management of a disease of condition for which distinctive nutritional requirements, based on recognized scientific principles, are established by medical evaluation." Thus, UX007 is clearly not a medical food.

In all previous trials of triheptanoin over the past 20 years, the food grade version was used and shown to be safe in humans at doses up to ~35% of total daily

caloric needs. If successful, Ultragenyx's pharmaceutical grade version will be the only version approved by the FDA to treat LC-FAOD or Glut1 DS. However, given the extensive clinical history (especially on safety) with food-grade triheptanoin, some have suggested that another company may attempt to introduce the food-grade product either as a medical food or as a supplement not marketed directly for a disease. Medical foods are not subject to the regulatory requirements that apply to drugs, and would not have to undergo premarket review or approval, although Current Good Manufacturing Practice (c-GMP) regulations still apply. A prescription is not required to obtain a medical food.

We expect Baylor University's patent #8,507,558 (licensed to Ultragenyx) will prevent any attempt to sell triheptanoin as a medical food or supplement due to composition of matter (CoM) protection. In our view, it would not make sense for any manufacturer to attempt to sell triheptanoin as a low-cost medical food or supplement product. If they were found to have knowingly infringed on Ultragenyx's patents, they would liable for treble damages caused to Ultragenyx.

We model for Triheptanoin peak revenue from LC-FAOD and Glut1 DS of $610M in 2028. Ultragenyx expects interim data from the Phase II trial in mid-2015. Assuming positive Phase III data in 2017, we anticipate that triheptanoin could enter the clinic in 2018. We estimate that there are 2.9K patients in the U.S., 4.7K in the E.U. and 6.6K in the ROW. We model for peak penetration at 24%, 23%, and 18%, respectively. We assume a price of $75K, leading to peak revenue of $202M in 2026. We do not currently model for the use of triheptanoin in metabolic disorders beyond fatty-acid oxidation disorders.

Triheptanoin is Highly Promising for the Glut1 DS Subtype of Refractory Epilepsy

The brain requires energy to function properly, and typically glucose is the primary source of this energy. Humans can survive and thrive on ketogenic diets, which involve eating very low amounts of carbohydrates, and essentially no glucose. Therefore, the body can somehow provide energy to the brain in conditions with negligible dietary consumption of glucose. Glut1 DS is caused by a mutation in the glucose transporter, a membrane protein that transports glucose from the plasma, across the blood-brain barrier (BBB) and into the central nervous system and brain, where it used as fuel. These mutations make the glucose transporter ineffective at moving glucose into the brain. There is a high degree of heterogeneity in these patients, with over 100 different mutations found in 200 patients worldwide (Klepper et al., 2012, Epilepsy Research; Wang et al., 2005, Annals of Neurology). One result of decreased glucose levels in the brain is possibly a decreased amount of energy available to support the function of neurons and supportive cells. To solve this problem, scientists have been researching how to move enough energy into the brain without using the Glut1 transporter. The ketogenic diet presents a way to achieve this as the ketone

bodies generated in low-glucose intake conditions are able to penetrate the BBB and provide energy to the brain. To date, one open-label Phase II study has been conducted in Glut1 DS patients, which we describe below.

The ketogenic diet's efficacy is proven in refractory epilepsy, validating the rationale behind triheptanoin. In clinical practice, the ketogenic is the gold standard in dietary manipulation for epilepsy treatment. Evidence for the diet's efficacy comes from a randomized, controlled clinical trial (Neal et al., 2008, The Lancet Neurology) and many smaller observational trials, although no double-blinded studies have been conducted to our knowledge. On a ketogenic diet, humans transform fat into ketone bodies, which can be used for energy in the brain because they cross the BBB. In theory, providing this alternate energy source to the brain could make up for the lack of glucose in the brain.

It is important to remember that there are also other consequences of decreased cerebrospinal fluid (CSF) glucose levels, including decreased levels of several other downstream products of glucose metabolism, such as pyruvate, which is a precursor to several neurotransmitters. Adding back a downstream substrate, while attractive in theory, may miss important metabolic intermediaries between the missing molecule and the one being replaced. However, with positive results in several studies reporting the benefits of a ketogenic diet in treating Glut1 DS, we believe that anaplerotic therapy (substrate replacement) using triheptanoin is promising. In our view, triheptanoin may show similar effects in terms of reducing the frequency of seizures, and with positive effects on both compliance and lower rates of hypoglycemia due to normalization of diet.

The ketogenic diet appears effective in Glut1 DS. Glut1 DS is a rare form of refractory epilepsy with a known cause: a missing glucose transporter to move glucose into the brain. Evidence supporting the efficacy of low-carb diets in Glut1 DS come from a small trial done in Norway, where 9/10 patients were seizure free after treatment with a ketogenic of modified Atkins diet (MAD) (Ramm-Petterson et al., 2012, Developmental Medicine and Child Neurology). Although a ketogenic diet may be effective for Glut1 DS, it is also very hard for patients to tolerate. Issues including hypoglycemia and fatigue are common due to low blood sugar. Another problem could be that because blood glucose levels are so low, brain levels may be even lower than in a Glut1 DS patient on a normal diet.

The strategy of using triheptanoin as an alternative energy source holds great promise for both efficacy and tolerability. It may be an ideal solution to ensure patients have high glucose levels to make use of the small amount of glucose that does get past the blood-brain barrier (BBB), while at the same time providing the ketone bodies as a an alternate energy source. The optimal fuel for the brain may still be glucose as ketone bodies cannot replace all of the intermediaries in those pathways. The strategy of using triheptanoin as an

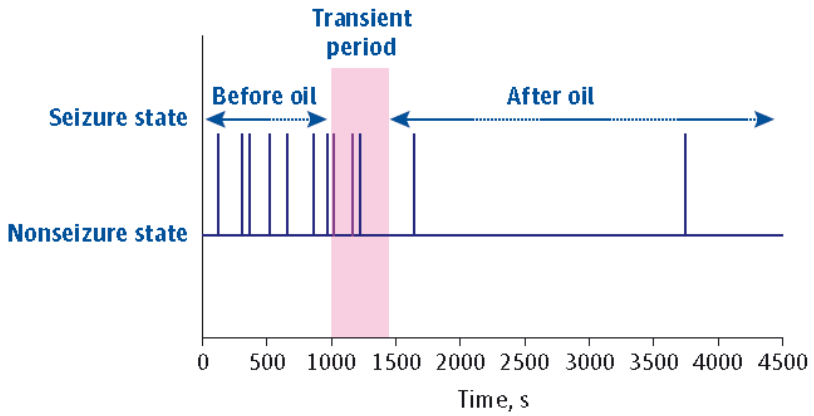
alternative energy source holds great promise for both efficacy and tolerability by normalizing the patient's diet.

A clinical study and multiple anecdotal reports validate triheptanoin's benefit in Glut1 DS patients. The first published clinical data on the use of triheptanoin for Glut1 DS was published recently (Pascual et al., 2014, JAMA Neurology), and shows promising initial proof-of-concept. In this open-label case series study of 14 children and adults with Glut1 DS, patients were dosed with triheptanoin, and both the acute (60-90 min) and longer-term (3 months) effects were measured several ways including EEG spike-waves, patient- or caretaker-reported seizure events, and language tests.

In terms of the acute effect of triheptanoin on EEG activity, data from one patient shows that triheptanoin was able to stop EEG spike-wave seizure activity upon administration to the patient (Figure 20). This effect was repeated across all of the patients who had epileptiform EEG spike-wave activity at baseline (Figure 21). Finally, the therapy also improved tests of vocabulary on two different tests: the Expressive Vocabulary Test, version 2 (EVT-2), and the Standardized Peabody Picture Vocabulary Test, version 4 (PPVT-4). These measures were taken at baseline, 60 min after triheptanoin oil administration, and again after 3 months of daily administration (Figure 22).

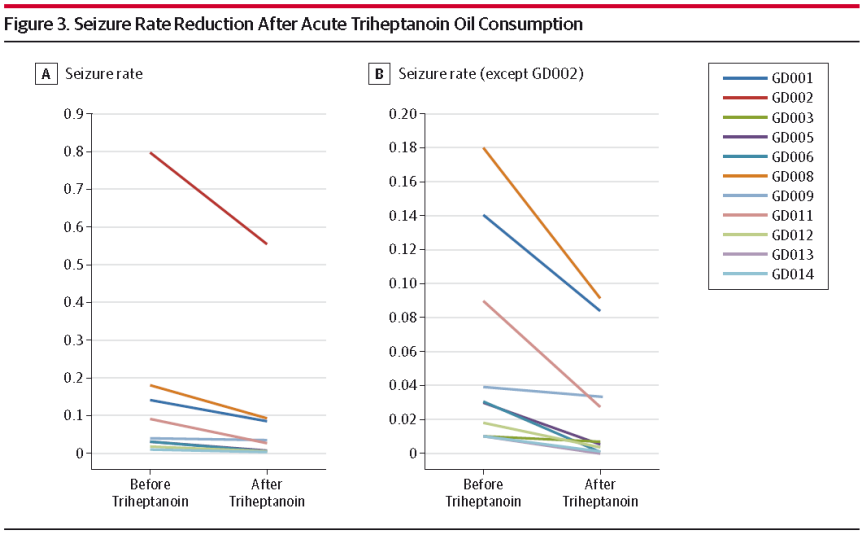
While triheptanoin showed promising changes on EEG, we note that EEG measures have a high false-positive rate for indicating seizure. In other words, many patients with EEG abnormalities do not exhibit seizures. Furthermore, these experiments were uncontrolled, thus we have no data on whether a high fat meal could have exhibited similar effects on acute EEG activity. The uncontrolled natures of these data warrant caution when evaluating the two vocabulary tests administered. Several factors may contribute to patient's improved performance over time, including gaining comfort with the test procedure or learning how to perform better over time. Ultragenyx is running a randomized, placebo-controlled, double blind, Phase II study to answer these questions.

Figure 20: Triheptanoin Appears to Halt Ongoing Acute Seizures as Measured By EEG Spike-Waves



Sources: Pascual et al., 2014, JAMA Neurology

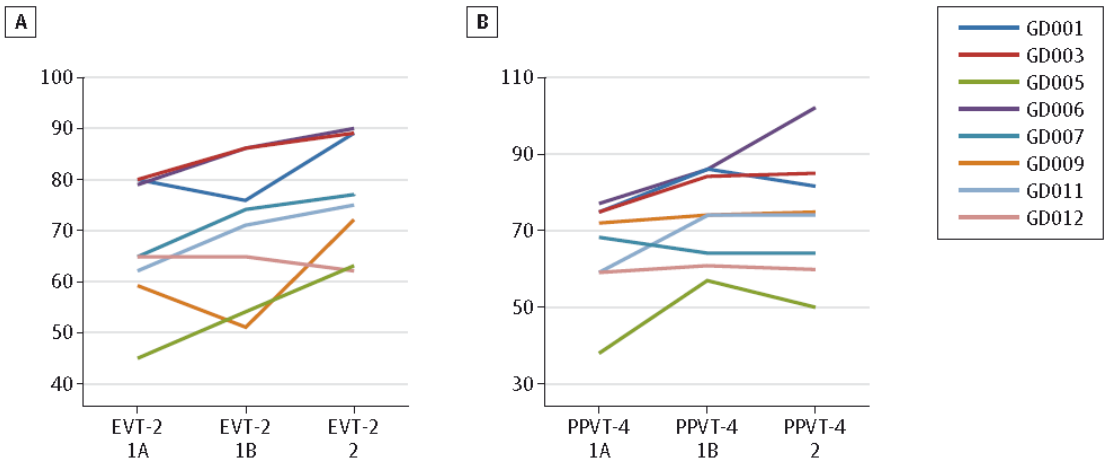
Figure 21: Acute Triheptanoin Consumption Appears to Decrease Seizure Rate



A, Seizure rate of all participants before and after triheptanoin oil consumption. B, Data representing the seizure rate of all participants except GDOO2 (who exhibited the largest seizure rate) before and after triheptanoin oil consumption. The vertical axis (note the different ranges) represents the fractional seizure rate in both panels. Participant GDOO7 manifested no seizure or other EEG abnormalities, and triheptanoin had no effect on his EEG.

Sources: Pascual et al., 2014, JAMA Neurology

Figure 22: Triheptanoin Appears to Improve Vocabulary Performance



Sources: Pascual et al., 2014, JAMA Neurology

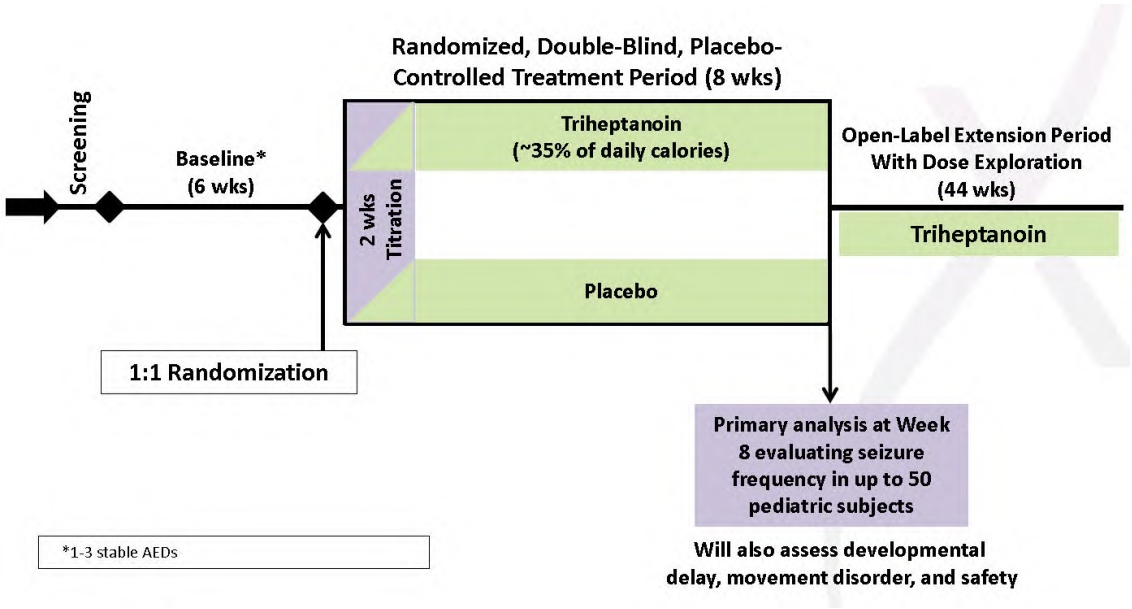
Our physicians view triheptanoin as likely to deliver welcome benefits over the ketogenic diet for Glut1 DS patients. Although there has never been a placebo-controlled trial demonstrating the benefit of the ketogenic diet in Glut1 DS, our physicians view it as effective. They note that a placebo-controlled trial involving severe dietary constraints is very difficult to conduct, and that many studies have shown reductions in seizure rates from baseline. The primary issue with the ketogenic diet is compliance. This problem manifests especially strongly in adolescents going through a rebellious phase. Triheptanoin is a welcome solution as it would allow for patients to normalize their diet while retaining the benefits of increased energy delivery to the brain. They view the safety profile of triheptanoin as de-risked do to over a decade worth of use as a medical food. On prevalence, our consultants view the disease as likely underdiagnosed for three main reasons. First, it can be lumped in with other types of refractory epilepsy, and there is currently no reason to attempt to differentiate the disorders because the ketogenic diet would be used in them all. Second, 90%, of patients have a sporadic mutation, and cannot be identified through family history. Third, testing for the disease is expensive (genetic sequencing), highly invasive (spinal tap required to examine glucose concentrations in the CSF), or labor intensive and not widely used (Dr. de Vivo's red blood cell assay at Columbia University Hospital). In terms of competition, the only promising treatment on the horizon is gene therapy, which is very early stage, and based in academia at the moment.

The Phase II trial is ongoing with data expected in mid-2015. Ultragenyx's Phase II trial of triheptanoin for Glut1 DS is designed to enroll 40 patients, and will obtain 6 weeks of baseline data (including seizure frequency for the primary endpoint) followed by randomization into a double-blind, controlled portion comparing triheptanoin at ~35% of daily calories to placebo safflower oil (Figure 23). The treatment portion will involve a 2 week titration followed by 6 weeks of

treatment at that dose. After 16 patients have completed the 8-week treatment period, an interim analysis will be conducted and a sample size re-estimation (SSRE) will take place. If certain interim analysis criteria are met, the study will be considered pivotal, and will enroll between 40-100 patients. It the primary endpoint is met in the final analysis, the trial could lead to registration with the FDA. While the primary endpoint is reduction in seizure frequency from baseline, several secondary endpoints will also be measured, including cognitive function using the Cambridge Neuropsychological Test Automated Battery (CABTAB), six minute walk test (6MWT), and gross motor function scores, among others.

If triheptanoin is successful in Glut1 DS, it may indicate the drug could be successful in multiple other types of refractory epilepsy. Multiple (non-Glut1 DS) preclinical seizure models have shown that triheptanoin can improve seizure frequency (Willis et al., 2010, Neurobiology of Disease; Borges et al., 2012, Epilepsy Research), and anecdotal evidence from many non-randomized trials indicate that wherever a ketogenic diet could work, triheptanoin has a solid chance of demonstrating efficacy (Neal et al., 2010, Journal of Human Nutrition and Dietetics). Our physician consultants believe this substantial body of evidence generated over more than 20 years indicates that the ketogenic diet and triheptanoin may display efficacy in many subtypes of refractory epilepsy. If Ultragenyx is able to demonstrate a benefit in Glut1 DS the ongoing Phase II trial, it will be the first truly successful placebo-controlled randomized trial testing a dietary intervention in epilepsy. Previous attempts have been made, but placebo controls were not satisfactory, in our view (Freeman et al. 2008, Epilepsia). Upon a successful Phase II (and SSRE-enabled Phase III), we view the prospects for triheptanoin showing a benefit in other types of refractory epilepsies as favorable.

Figure 23: Triheptanoin for Glut1 DS Phase II Trial Design (Trial #UX007G-CL201)



Sources: Company reports

We model for triheptanoin peak revenue from Glut1 DS of $322M in 2028. Ultragenyx expects interim data from the ongoing Phase II trial in mid-2015, which could support progression to a registration trial and commercialization in 2018. We estimate that there are approximately 4.7K patients in the U.S., 7.6K in the E.U., 10.7K and in ROW. We model for peak penetration at 29.8%, 26.7%, and 19.9%, respectively. We assume an annual price of $75K, leading to peak revenue of $322M in 2028. We do not currently model for triheptanoin use in other subtypes of epilepsy, and view those indications as upside to our estimates.

SA-ER for HIBM: Mixed Data Thus Far for a Progressive Muscle Weakness Disorder

Sialic acid extended release (SA-ER) is an oral substrate replacement therapy, a small molecule in development for hereditary inclusion body myopathy (HIBM), also called GNE myopathy of distal myopathy. The latest results from the extension of the Phase II trial showed that the 12g dose was not superior to the 6g dose and may have an increased rate of mild-to-moderate gastrointestinal adverse events (flatulence). Thus, we expect Ultragenyx to proceed into a Phase III trial with the 6g dose (biggest efficacy signal with lowest side effects) to begin in mid-2015.

HIBM is caused by a deficiency caused by a defect in the GE/MNK enzyme in the biosynthetic pathway required for the production of sialic acid within the cell. Patients typically present with the disease between 18-30 years of age and experience loss of major muscle function over the next 10-20 years. Japanese patients typically have earlier onset, while Jewish patients usually have later initial symptoms; we do not understand the clinical rationale.

We estimate that there are approximately 1.2K - 2K patients in the developed world, with 300-400 of those in Japan (200 of which have been diagnosed and identified). Our physician consultants suggest that a high proportion of diagnosed patients will be treated. We assign a 50% probability of success to SA-ER, and forecast peak penetration at 83% in the U.S., 81% in the E.U., and 66% in ROW. We assume initial pricing of $50K, which translate into revenue of $69M in 2028.

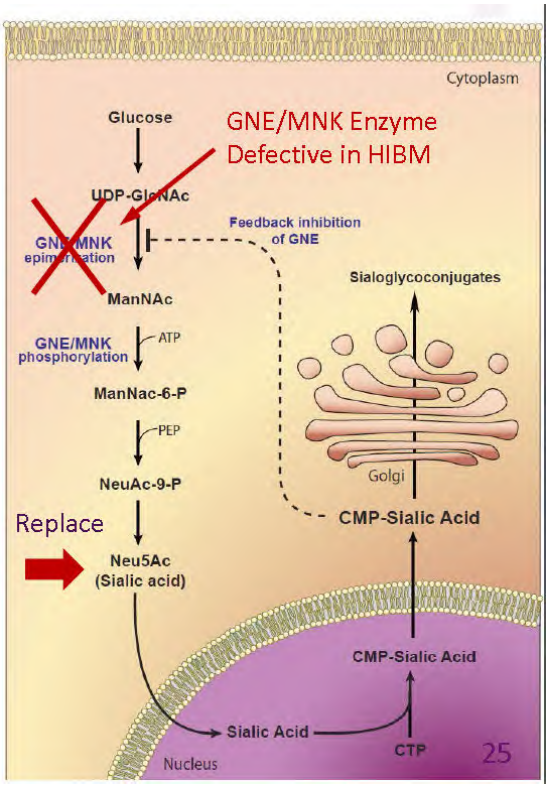
Physician feedback indicates variable genetics and clinical severity. Our physician consultants estimate the prevalence of the disease at 1K to 2K patients worldwide, with a concentration in Japan (300 - 400 patients). They felt that Japanese neurologists are well-trained in myopathies and that is it unlikely that there are large populations of patients who are undiagnosed in Japan. They also noted the wide range of clinical pathology, given some patients do not enter the hospital as their disease is mild. While the correlations between genotype and phenotype are generally not well developed, some mutations such as the 572L mutation (the most common mutation) are associated with greater disease severity. It may also be important to keep in mind that sialic acid is present in many foods (typically high in eggs and dairy/whey products) and could affect patient outcomes.

In theory, replacing the critical downstream product of this pathway (sialic acid) via substrate replacement could rescue patients from the enzymatic deficiency (Figure 24). Interestingly, lower extremity muscle weakness is often the first sign of the disease. The initial symptom is typically referred to as ‘foot drop,’ wherein the front side of the shim is unable to pull the toes up in the air. This is where the name “distal myopathy” comes from.

Physicians are positive on SA-ER reducing the rate of muscle function decline. Our physician consultants believe the mechanism of action for SA-ER is well-understood from mouse models that demonstrated freedom from pathology when treated. They view Ultragenyx’s extended release formulation as a significant improvement that is required for the drug to show a clinical benefit. The PK/PD data from the regular release version was sub-par, but the extended release is likely to result in the drug reaching the desired target. They were pleasantly surprised by the 48-week Phase II data, noting that if SA-ER was able to restore some muscle function (although only on upper-body strength, and not lower) it should be used in all patients. They feel that the drug has a solid chance

at preventing the decline of muscle function, which is consistent with preclinical tests. They do not see any major safety problems, but noted that gastric discomfort may have been an issue at the 12g dose, and Ultragenyx will likely stick with 6g going forward. They also noted that sialic acid is found in everyday foods, and thus should not present a major problem on safety, and results thus far have been consistent with this hypothesis. In terms of the Phase III, they would like to see data from a 6MWT, and if positive, they would prescribe the drug to all their HIBM patients, especially the least severe ones as the drug would be preventing the decline of muscle function over time. Patients that have very low muscle function to begin with would be less likely to benefit. On prevalence, they view the disease as possibly underdiagnosed in most of the world, but likely accurately diagnosed in Japan, where doctors are well-trained to find myopathies and aware of HIBM (>250 patients have been diagnosed there).

Figure 24: GNE/MNK Enzyme Deficiencies Likely Cause HIBM. SA-ER is Designed to Replace a Downstream Product of the Missing Enzymatic Activity.

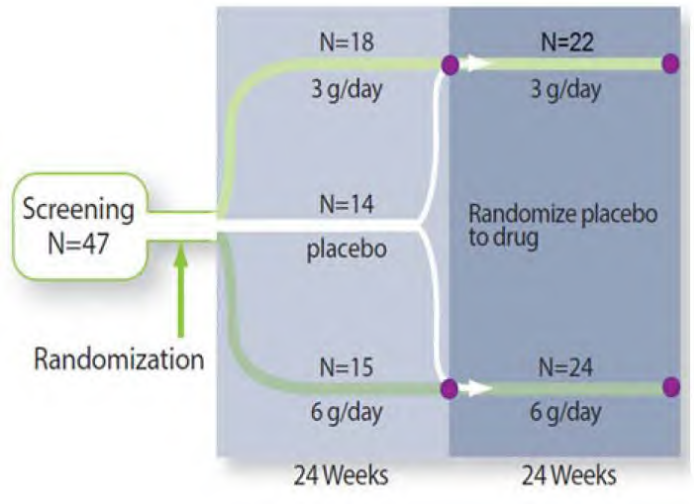


Source: Company reports

Phase II data were mixed with a statistically significant benefit for the 6mg dose on the upper extremity strength endpoint, but not benefit on lower extremities. The Phase II trial evaluated two doses of SA-ER (3 g vs 6 g) against a placebo arm in 47 patients for a period of 48 weeks. The trial was randomized, double blind, and placebo-controlled. Dosing was oral and daily for 48 weeks for both treatment arms, while placebo patients were allowed to cross over to the treatment arms (in a randomized fashion) after the first 24 weeks (Figure 25).

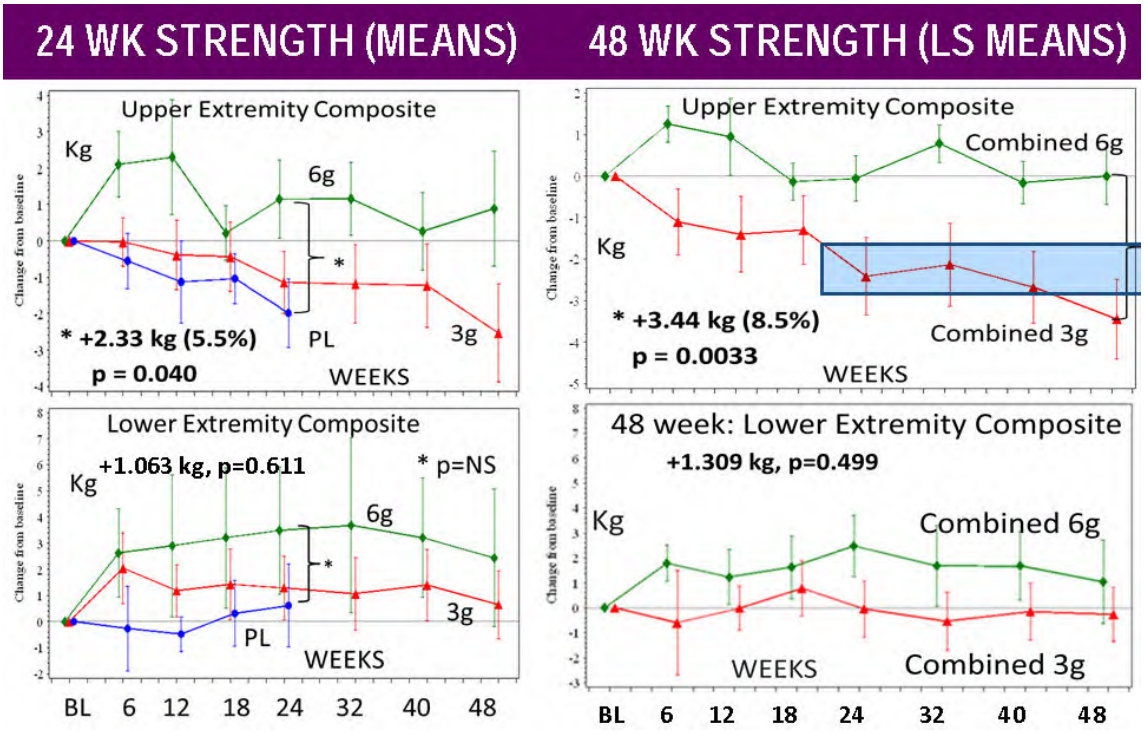
At 24 weeks, the 6g dose group showed a statistically significant improvement over placebo and the pooled 6g does was also superior to the pooled 3g dose on the upper extremity strength composite measure at 48 weeks, indicating there might be a dose-response relationship between dose level and efficacy. However, both doses failed to show a significant benefit on the lower extremity composite (Figure 26). This could be due to several reasons, including: 1) lower extremity muscles could have deteriorated too far to have been helped by the drug; 2) 24 or 48 weeks may not be a sufficient treatment period to detect a benefit in a condition that typically progresses over the course of 1-2 decades; or 3) the small number of patients, combined with variable severity of disease at baselines may have made detection of even large effects challenging. We also note that the incoming baselines of the patients assigned to the 6g/6g group were higher than those of the other groups (Figure 27). It may be possible that less severe patients tend to do better over time with slower progression of disease. If this is true, the difference in baseline could make the trial hard to interpret. We look forward to Phase III data to answer this question more definitively.

Figure 25: Study Design for fhe Phase II Trial



Source: Company reports

Figure 26: SA-ER Demonstrated a Statistically Significant Improvement on the Upper Extremity Composite Measure at the 6g Dose, but not at the 3g Dose, and not on the Lower Extremity Endpoint.



Source: American Academy of Neurology, 2014

Figure 27: High Degree of Muscle Strength Variability at Baseline in the Phase II Trial

Baseline Muscle Strength Reduced

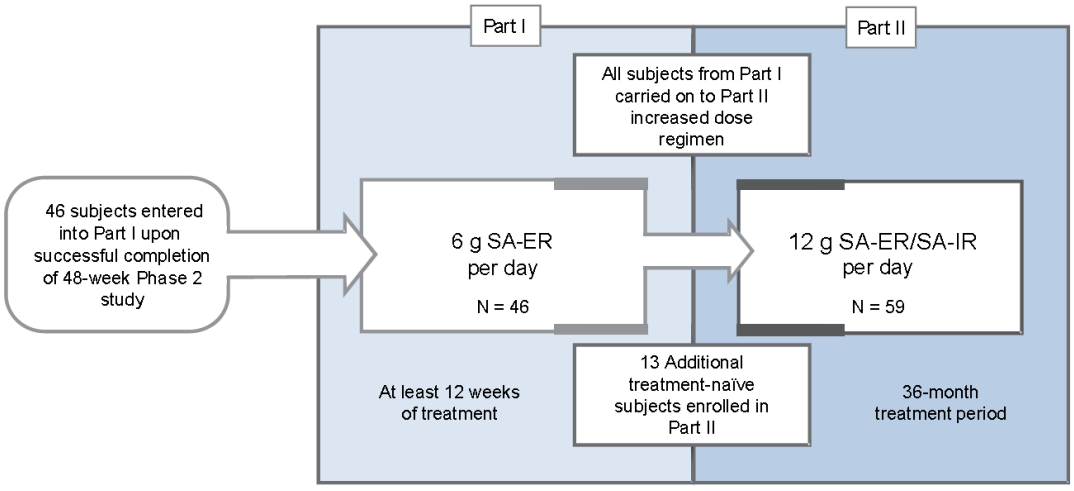
Muscle Assessed (Percent Predicted)	6/6 g	3/3 g	0/6 g	0/3 g	Mean
Grip	52.8	40.57	44.04	44.07	45.37
Elbow Flexors	50.68	43.24	45.39	44.43	45.94
Elbow Extensors	46.93	39.16	36.12	40.63	40.71
Shoulder Abductors	48.38	38.64	40.80	40.78	42.15
Upper Extremity (mean)	**49.70**	**40.40**	**41.59**	**42.48**	**43.54**
Hip Flexors	14.36	4.61	6.46	9.11	8.64
Hip Extensors	34.69	25.91	26.87	26.48	28.49
Hip Abductors	56.15	43.76	56.55	45.57	50.51
Hip Adductors	24.21	12.69	25.72	22.74	21.34
Knee Flexors	22.39	10.86	17.33	14.96	16.39
Lower Extremity (mean)	**30.36**	**19.57**	**26.59**	**23.77**	**25.07**
Knee Extensors	61.25	56.34	55.08	54.67	56.84

6g/6g patients had higher mean baseline strength than other groups; milder symptoms may have resulted in better results

Source: American Academy of Neurology, 2014

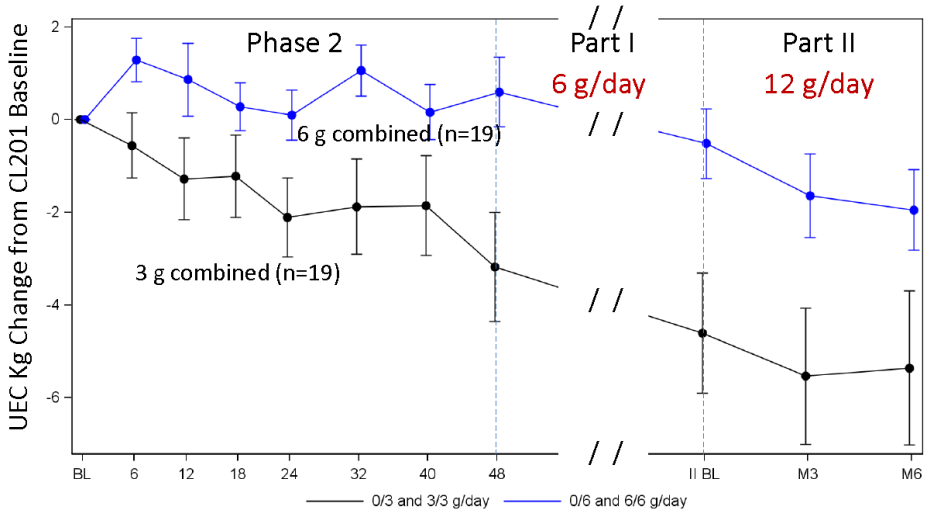
Phase II extension demonstrated that the 12g/day was not superior to 6g/day on the UEC score. Since the presentation at the 2014 American Academy of Neurology meeting (April 2014), Ultragenyx reported data (October 13, 2014) from an extension study of the Phase II where they evaluated an increase in dosing to 12g.day. The extension phase enrolled 46 patients from the Phase II, plus a cohort of 13 treatment-naïve patients (Figure 28). All patients received the higher 12g dose. Unfortunately, this dose did not display a change on the upper extremity composite (UEC) score over the 6g gram dose during the 36-months treatment period (Figure 29), and gastrointestinal side effects were worse on the higher dose. This is in line with management's previous assertion that preclinical animal data suggests a flat response curve beyond 6g, so an improved response at 12g would have been somewhat unexpected.

Figure 28: SA-ER Phase II Extension Study Design



Source: American Academy of Neurology, 2014

Figure 29: The 12g/Day Dose Did Not Change UEC Muscle Function Decline Vs. the 6g/Day dose.



Values are mean ± SE
/ / indicates that study period between 6g/day extension study baseline (Part I) and 12g/day extension Baseline (Part II) varies among rollover subjects

Source: American Academy of Neurology, 2014

SA-ER will likely move forward at the 6g dose in a Phase III trial to begin in mid-2015. In the data presentation at the World Muscle Society, Ultragenyx indicated that Phase III study planning is underway, with discussions with regulatory authorities ongoing. Our conversations with management lead us to believe that the company will begin a Phase III trial in mid-2015 at the 6g dose to maximize efficacy while minimizing mild to moderate gastrointestinal side effects.

We model for SA-ER peak revenue of $69M in 2028. We model for positive data in 2016 supporting approval and commercialization in 2017. We estimate that there are approximately 1.2K - 2K patients in the developed world, with 300-400 of those in Japan (200 of which have been diagnosed and identified). Our physician consultants suggest that a high proportion of diagnosed patients will be treated. Thus, we model for peak penetration at 83% in the U.S., 81% in the E.U., and 66% in ROW. We assume annual pricing of $50K, which translate into revenue of $69M in 2028.

RhPPCA for Galactosialidosis is Preclinical but Promising

Recombinant human protective protein cathepsin-A (rhPPCA) is an ERT in development for galactosialidosis, an autosomal recessive LSD. The disease is similar to the MPS disorders in that substrates build up within the lysosomes of

cells, although these substrates are oligosaccharides as opposed to glycosaminoglycans (GAGs). Symptoms include skeletal and organ dysfunction and reduced lifespan. rhPPCA is currently in preclinical development, has shown promising activity in mouse models of galactosialidosis, and may enter the clinic in 2015/2016. Ultragenyx estimates there are 300-500 galactosialidosis patients in the developed world. We do not include potential revenue from rhPPCA due to its preclinical stage in development.

Intellectual Property

Triheptanoin (UX007) is a pharmaceutical product (not a medical food), and we believe will have strong IP protection until 2025.

Ultragenyx holds patents on or is pursuing alternative forms of IP protection for each of its developmental candidates. We believe the most important IP to review here is for triheptanoin, as it has been previously used in investigator-sponsored trials (ISTs) as a medical food, and previously manufactured and distributed by SASOL GmbH (Roe and Mochel et al., 2006). Ultragenyx's compound, UX007, is a pharmaceutical product subject to the regulatory oversight including pre-market testing and approval. UX007 is not a medical food under the FDA's definition detailed in their guidance.

Ultragenyx has licensed 24 patents from Baylor Research Institute that expire 2020-2024 (CoM expires in 2020). Ultragenyx owes Baylor at mid-single digit royalty on sales We expect Baylor University's patent #8,507,558 (licensed to Ultragenyx) will prevent any attempt to sell triheptanoin as a medical food or supplement due to composition of matter (CoM) protection. In our view, it would not make sense for any manufacturer to attempt to sell triheptanoin as a low-cost medical food or supplement product because if they were found to have knowingly infringed on Ultragenyx's patents, they would liable for treble the damages caused to Ultragenyx. We estimate that this key CoM patent will expire on June 26th, 2020. This calculation does not include the possible 5 year Hatch-Waxman extension provided to new chemical entity approvals. We expect that Ultragenyx will obtain this additional five years, which would provide protection until June 26th, 2025.

Ultragenyx has licensed 2 other CoM patents relating to the specific formulation of triheptanoin. We view these patents as easier to engineer around due to the greater specificity of the defined formulation. We do not expect these patents to provide more than 4 months of additional protection as they both expire in 2025.

Figure 30: Triheptanoin Intellectual Property

Patent number	Type	Key Claim	Expiry*
8,697,748	CoM	A composition comprising an active agent, wherein the active agent consists essentially of a **triheptanoin,** and wherein the composition has an acid value of 0.1 or less mg KOH/gr, a hydroxyl value of 2.8 or less mg KOH/gr.	10/3/25
8,507,558	CoM	A composition comprising a seven carbon fatty acid source in a dosage unit, wherein the dosage unit comprises at least about 15 grams of the seven carbon fatty acid source and wherein the composition is provided in an amount suitable for providing 15% to 40% of the daily dietary calories of a human, wherein the seven carbon fatty acid source is selected from the group consisting of n-heptanoic acid, a triglyceride comprising n-heptanoic acid and **triheptanoin** and wherein the composition does not contain long-chain or very long-chain fatty acid.	6/26/20
8,106,093	CoM	A pharmaceutical composition for treating a type II glycogen storage disease comprising: a pharmaceutically effective amount of an odd carbon fatty acid that comprises seven or less carbons that is substantially immediately bioavailable and is at least partially water-solubleand is sufficient to treat the glycogen storage disease, wherein the odd carbon fatty acid is adapted for a dosage of between 1 to 2 grams per kilogram body weight per day, wherein the odd carbon fatty acid comprises an acid value of 0.1 or less mg KOH/gr, a hydroxyl value of 2.8 or less mg KOH/gr;	9/19/25
6,740,679	MoU	A method of treating a patient having an inherited or acquired deficiency in at least one enzyme involved in fatty acid metabolism comprising administering to said patient a composition comprising an effective amount of a seven-carbon fatty acid chain or derivative thereof, wherein said seven-carbon fatty acid chain or derivative thereof is characterized by the ability to transverse the inner mitochondrial membrane by a transport mechanism which does not require carnitine palmitoyltransferase I, carnitine palmitoyltransferase II, or carnitine/acylcarnitine translocase and the ability to undergo mitochondrial β-oxidation, and wherein said compound is selected from the group consisting of n-heptanoic acid or a derivative thereof, a triglyceride comprising n-heptanoic acid or a derivative thereof, and **triheptanoin** or a derivative thereof.	2/3/20

Sources: Patent literature, USPTO Public PAIR, STRH Research
Abbreviations: CoM, composition of matter; MoU, method of use.

Ultragenyx has strong IP protection for the rest of the pipeline.

For KRN23, Ultragenyx has a collaboration agreement in place with KHK that includes KHK booking sales in the U.S. and Canada at a 50:50 profit share during the first 5 years of launch, and then a mid-to-high 20% royalty of revenue thereafter, the E.U., Switzerland and Turkey at a 10% royalty on sales to Ultragenyx. In Mexico and Latin America, Ultragenyx will commercialize KRN23 and owe a low single-digit royalty to KHK, in addition to paying KHK for the supply of the drug at a double-digit percentage of net sales. KHK holds 24 licensed patents covering KRN23, the latest of which expires in 2029. .

With regard to rhGUS for MPS VII, Ultragenyx has obtained a license from St Louis University, on which it owes a low single digit royalty based on sales. Ultragenyx is filing for additional patents on rhGUS composition of matter (CoM), method of use (MoU, i.e. to treat a disease, dosing), formulation, and method of making (MoM).

For SA-ER, Ultragenyx has licensed IP from Nobelpharma in return for a mid-single digit royalty on sales outside of Japan, with IP expiry ranging from 2028-2034.

Financials

In 2Q 2014, Ultragenyx reported no revenue and a net loss of $13.6M, or $0.45 per share. As of June 30, 2014, Ultragenyx had $153.3M in cash, cash equivalents, and short-term investments. On July 14th, 2014, the company closed on a follow-on offering with estimated net proceeds of approximately $60.2M, resulting in total cash and equivalents of ~$213M. The company's operating expenses for 2Q 2014 were $13.6M.

At the current cash expense rate, we estimate that the company's cash is sufficient to fund operations through mid-2016. This should provide adequate runway for the pipeline to read out positively or to bring in new therapeutics and test them via relatively less expensive trials in small patient populations with ultra-rare genetic disorders.

We model for two equity offerings in Q4 2015 ($150M) and 2017 ($200M), which will provide the cash needed to complete trials for the current clinical programs, and to in-license and develop other products.

Management Compensation

In our view, Ultragenyx management's incentives are well-aligned with shareholders, with 30% of 2013 compensation in the form of stock options. The strike prices of these options range from $0.31 per share to $6.86 per share, and thus they are in the money at the current share price above $50.

We note that Mrs. Sharp, the CFO, and Mr. Kassberg, the Chief Business Officer, have adopted trading plans under Rule 10b5-1, and have commenced selling some of their stock. We view these stock sales as reasonable portfolio diversification. We also note that Mr. Kakkis, the CEO, has not sold any of his common stock.

Figure 31: Management Compensation in 2013 & 2012

Name	Title	Year	Salary	Bonus	Option Awards	Non-equity incentive plan compenstaion	Other compensation	Total	% of compensation delivered as options
Emil D. Kakkis, M.D., Ph.D.	President and Chief Executive Officer	2013	$ 306,034	—	$ 218,873	$ 140,910	$ 19,721	$ 685,538	32%
		2012	$ 300,172	—	—	$ 92,125	$ 9,056	$ 401,353	0%
Thomas Kassberg	Chief Business Officer and Senior Vice President	2013	$ 289,419	—	$ 182,394	$ 114,345	$ 20,352	$ 606,510	30%
		2012	$ 272,041	—	—	$ 81,813	$ 15,640	$ 369,494	0%
Shalini Sharp	Chief Financial Officer and Senior Vice President	2013	$ 278,440	$ 30,000	$ 182,394	$ 110,206	$ 24,193	$ 625,233	29%
		2012	$ 148,669	—	$ 90,042	$ 51,560	$ 13,228	$ 303,499	30%

Sources: SEC filings, STRH research

Ultragenyx Pharmaceutical

(NASDAQ: RARE)

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Consolidated Income Statement
($thousands, except per share data)

Revenue Build

KRN23 market

U.S. / Canada

		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total U.S. + Canada population ('000)	1%	348,518	351,596	352,472	353,350	354,230	355,112	355,112	358,663	362,250	365,872	369,531	373,226	376,959	380,728	384,535
Prevalence of XLH		*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*
Number of pediatric XLH patients	25%	3,311	3,340	3,348	3,357	3,365	3,374	3,374	3,407	3,441	3,476	3,511	3,546	3,581	3,617	3,653
Penetration into pediatric XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*1.4%*	*13.8%*	*21.0%*	*25.7%*	*29.7%*
Number of adult XLH patients		9,933	10,020	10,045	10,070	10,096	10,121	10,121	10,222	10,324	10,427	10,532	10,637	10,743	10,851	10,959
Penetration into adult XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.3%*	*7.0%*	*10.4%*	*13.0%*	*14.2%*
Total number of XLH patients on KRN23		-	-	-	-	-	-	-	-	-	-	81	1,234	1,870	2,340	2,641
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 100,000	$ 103,000	$ 106,090	$ 109,273	$ 112,551
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 85,000	$ 87,550	$ 90,177	$ 92,882	$ 95,668
Total U.S. + Canada KRN23 sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,863**	**$ 108,027**	**$ 168,603**	**$ 217,357**	**$ 252,677**
COGS (% of Sales)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0%	15.0%	15.0%	15.0%	15.0%
COGS ('000)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$343	$16,204	$25,290	$32,604	$37,902
Gross Profit		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 6,520	$ 91,823	$ 143,312	$ 184,753	$ 214,776
Sales and Marketing (% of Sales)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50.0%	45.0%	35.0%	30.0%	28.0%
Sales and Marketing ('000)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,432	$48,612	$59,011	$65,207	$70,750
R&D (% of Sales)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20.0%	15.0%	13.0%	12.0%	11.0%
R&D ('000)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,373	$16,204	$21,918	$26,083	$27,794
Net Income ('000)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 1,716	$ 27,007	$ 62,383	$ 93,463	$ 116,232
Total U.S./Canada KRN23 royalty/profit share to RARE ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 858**	**$ 13,503**	**$ 31,191**	**$ 46,732**	**$ 58,116**
														Profit share		

E.U.

		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total E.U. population ('000)	1%	510,011	515,111	516,394	517,680	518,970	520,262	520,262	525,465	530,720	536,027	541,387	546,801	552,269	557,792	563,370
Prevalence of XLH		*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*
Number of pediatric XLH patients	25%	4,845	4,894	4,906	4,918	4,930	4,942	4,942	4,992	5,042	5,092	5,143	5,195	5,247	5,299	5,352
Penetration into pediatric XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*2.0%*	*7.5%*	*15.0%*	*20.0%*
Number of adult XLH patients		14,535	14,681	14,717	14,754	14,791	14,827	14,827	14,976	15,126	15,277	15,430	15,584	15,740	15,897	16,056
Penetration into adult XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*2.0%*	*5.8%*	*8.4%*
Total number of XLH patients on KRN23		-	-	-	-	-	-	-	-	-	-	-	104	708	1,717	2,419
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 85,000	$ 85,000	$ 85,000	$ 85,000	$ 85,000
Total E.U. KRN23 sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 8,831**	**$ 60,204**	**$ 145,935**	**$ 205,624**
Total E.U. KRN23 royalty to RARE ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 883**	**$ 6,020**	**$ 14,594**	**$ 20,562**

ROW (Latin America)

		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total Latin America population ('000)	1%	587,214	593,086	594,563	596,044	597,529	599,017	599,017	605,007	611,057	617,168	623,339	629,573	635,869	642,227	648,650
Prevalence of XLH		*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*	*0.004%*
Number of pediatric XLH patients	25%	5,579	5,634	5,648	5,662	5,677	5,691	5,691	5,748	5,805	5,863	5,922	5,981	6,041	6,101	6,162
Penetration into pediatric XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.6%*	*3.5%*	*5.5%*	*6.7%*
Number of adult XLH patients		16,736	16,903	16,945	16,987	17,030	17,072	17,072	17,243	17,415	17,589	17,765	17,943	18,122	18,303	18,487
Penetration into adult XLH population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.9%*	*1.7%*	*2.3%*
Total number of XLH patients on KRN23		-	-	-	-	-	-	-	-	-	-	-	33	375	647	838
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 85,000	$ 85,000	$ 85,000	$ 85,000
Total ROW KRN23 sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 2,796**	**$ 31,835**	**$ 54,971**	**$ 71,235**
TOTAL KRN23 sales - WW ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 6,863**	**$ 119,654**	**$ 260,642**	**$ 418,263**	**$ 529,536**

Sources: Company reports, STRH Research

rhGUS market

U.S.

		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total U.S. population ('000)	1%	314,706	317,292	318,083	318,875	319,669	320,465	320,465	323,670	326,907	330,176	333,478	336,812	340,180	343,582	347,018
Prevalence of MPS 7		*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*
Total number of cases of MPS 7		35	35	35	35	35	35	35	36	36	36	37	37	37	38	38
Penetration into eligible MPS 7 population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*5.0%*	*51.1%*	*68.0%*	*77.4%*	*82.4%*	*88.9%*
Total number of MPS 7 patients on rhGUS		-	-	-	-	-	-	-	-	-	2	19	25	29	31	34
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 400,000	$ 412,000	$ 424,360	$ 437,091	$ 450,204	$ 463,710
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 340,000	$ 350,200	$ 360,706	$ 371,527	$ 382,673	$ 394,153
Total U.S. rhGUS sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617	**$ 6,564**	**$ 9,087**	**$ 10,761**	**$ 11,917**	**$ 13,376**

ROW

		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total ROW population ('000)	1%	1,515,000	1,530,150	1,533,961	1,537,782	1,541,612	1,545,452	1,545,452	1,560,906	1,576,515	1,592,280	1,608,203	1,624,285	1,640,528	1,656,933	1,673,503
Prevalence of MPS 7		*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*	*0.000011%*
Total number of cases of MPS 7		167	168	169	169	170	170	170	172	173	175	177	179	180	182	184
Penetration into eligible MPS 7 population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*12.3%*	*38.0%*	*59.1%*	*63.4%*	*69.4%*
Total number of MPS 7 patients on rhGUS		-	-	-	-	-	-	-	-	-	-	22	68	107	116	128
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 340,000	$ 340,000	$ 340,000	$ 340,000	$ 340,000	$ 340,000
Total U.S. rhGUS sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 7,398**	**$ 23,084**	**$ 36,261**	**$ 39,289**	**$ 43,437**
TOTAL rhGUS sales - WW ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617	**$ 13,962**	**$ 32,172**	**$ 47,022**	**$ 51,206**	**$ 56,812**

Sources: Company reports, STRH Research

Triheptanoin market

U.S.		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2015E	FY 2020E	FY 2021E	FY 2022E
Total U.S. population ('000)		314,706	317,292	318,083	318,875	319,669	320,465	320,465	323,670	326,907	330,176	333,478	336,812	340,180	343,582	347,018
Prevalence of LC-FAOD		*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*
Total number of cases of LC-FAOD		2,518	2,538	2,545	2,551	2,557	2,564	2,564	2,589	2,615	2,641	2,668	2,694	2,721	2,749	2,776
Penetration into LC-FAOD population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.2%*	*6.5%*	*12.5%*	*17.5%*	*20.3%*
Prevalence of Glut1 DS		*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*
Total number of cases of Glut1 DS		4,091	4,125	4,135	4,145	4,156	4,166	4,166	4,208	4,250	4,292	4,335	4,379	4,422	4,467	4,511
Penetration into Glut1DS population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.1%*	*3.9%*	*10.5%*	*15.4%*	*19.4%*
Total number of patients on triheptanoin		-	-	-	-	-	-	-	-	-	-	10	346	805	1,169	1,439
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 75,000	$ 77,250	$ 79,568	$ 81,955	$ 84,413
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 63,750	$ 65,663	$ 67,632	$ 69,661	$ 71,751
Total U.S. Triheptanoin sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617	$ 22,713	$ 54,412	$ 81,425	$ 103,231

E.U.		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total E.U. population ('000)		510,011	515,111	516,394	517,680	518,970	520,262	520,262	525,465	530,720	536,027	541,387	546,801	552,269	557,792	563,370
Prevalence of LC-FAOD		*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*
Total number of cases of LC-FAOD		4,080	4,121	4,131	4,141	4,152	4,162	4,162	4,204	4,246	4,288	4,331	4,374	4,418	4,462	4,507
Penetration into LC-FAOD population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*5.6%*	*13.5%*	*18.5%*	*20.0%*
Prevalence of Glut1 DS		*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*
Total number of cases of Glut1 DS		6,630	6,696	6,713	6,730	6,747	6,763	6,763	6,831	6,899	6,968	7,038	7,108	7,179	7,251	7,324
Penetration into Glut1DS population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.9%*	*6.5%*	*13.4%*	*18.7%*
Total number of patients on triheptanoin		-	-	-	-	-	-	-	-	-	-	-	309	1,063	1,797	2,271
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 75,000	$ 75,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 63,750	$ 63,750
Total E.U. Triheptanoin sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 114,572	$ 144,773

ROW		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total ROW population ('000)	1%	713,464	720,599	722,393	724,193	725,996	727,805	727,805	735,083	742,433	749,858	757,356	764,930	772,579	780,305	788,108
Prevalence of LC-FAOD		*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*	*0.0008%*
Total number of cases of LC-FAOD		5,708	5,765	5,779	5,794	5,808	5,822	5,822	5,881	5,939	5,999	6,059	6,119	6,181	6,242	6,305
Penetration into LC-FAOD population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*4.3%*	*9.0%*	*12.3%*
Prevalence of Glut1 DS		*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*	*0.0013%*
Total number of cases of Glut1 DS		9,275	9,368	9,391	9,415	9,438	9,461	9,461	9,556	9,652	9,748	9,846	9,944	10,044	10,144	10,245
Penetration into Glut1DS population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*1.3%*	*6.2%*	*9.7%*
Total number of patients on triheptanoin		-	-	-	-	-	-	-	-	-	-	-	-	396	1,191	1,769
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 75,000	$ 75,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 63,750	$ 63,750
Total ROW Triheptanoin sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 75,910	$ 112,793
TOTAL Triheptanoin sales - WW ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 617	$ 22,713	$ 54,412	$ 271,907	$ 360,797

Sources: Company reports, STRH Research

SA-ER market

U.S.		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total U.S. population ('000)		314,706	317,292	318,083	318,875	319,669	320,465	320,465	323,670	326,907	330,176	333,478	336,812	340,180	343,582	347,018
Prevalence of HIBM		*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*
Total number of eligible new cases of HIBM		346	349	350	351	352	353	353	356	360	363	367	370	374	378	382
Penetration into eligible HIBM population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*3.5%*	*15.0%*	*35.0%*	*49.8%*	*64.0%*
Total number of HIBM patients on SA-ER		-	-	-	-	-	-	-	-	-	-	13	56	131	188	244
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 50,000	$ 51,500	$ 53,045	$ 54,636	$ 56,275	$ 57,964
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 42,500	$ 43,775	$ 45,088	$ 46,441	$ 47,834	$ 49,269
Total U.S. SA-ER sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 562	$ 2,506	$ 6,082	$ 9,003	$ 12,036

E.U.		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total E.U. population ('000)		510,011	515,111	516,394	517,680	518,970	520,262	520,262	525,465	530,720	536,027	541,387	546,801	552,269	557,792	563,370
Prevalence of HIBM		*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*
Total number of eligible new cases of HIBM		561	567	568	569	571	572	572	578	584	590	596	601	607	614	620
Penetration into eligible HIBM population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*1.5%*	*10.1%*	*25.4%*	*43.1%*	*57.4%*
Total number of HIBM patients on SA-ER		-	-	-	-	-	-	-	-	-	-	9	61	154	264	356
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 50,000	$ 51,500	$ 53,045	$ 54,636	$ 56,275	$ 57,964
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 42,500	$ 43,775	$ 45,088	$ 46,441	$ 47,834	$ 49,269
Total E.U. SA-ER sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 391	$ 2,739	$ 7,166	$ 12,650	$ 17,526

ROW		FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Total ROW population (ex-Japan; '000)	1%	505,000	510,050	511,320	512,594	513,871	515,151	513,234	518,366	523,550	528,785	534,073	539,414	544,808	550,256	555,759
Prevalence of HIBM		*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*	*0.00011%*
Total number of eligible new cases of HIBM		556	561	562	564	565	567	565	570	576	582	587	593	599	605	611
Penetration into eligible HIBM population		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*2.0%*	*9.8%*	*23.4%*	*40.8%*	*55.5%*
Total number of HIBM patients on SA-ER		-	-	-	-	-	-	-	-	-	-	12	58	140	247	339
Gross cost per treatment per patient		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Net cost per treatment per patient (gross to net)	85%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$ 42,500	$ 42,500	$ 42,500	$ 42,500	$ 42,500	$ 42,500
Total ROW SA-ER sales ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 499	$ 2,471	$ 5,960	$ 10,496	$ 14,420
											Royalty	5%	5%	5%	5%	5%
Total ROW KRN23 royalty/profit share to RARE ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25	$ 124	$ 298	$ 525	$ 721
TOTAL SA-ER sales - WW ($'000)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,452	$ 7,716	$ 19,208	$ 32,148	$ 43,982

Sources: Company reports, STRH Research

Ultragenyx Pharmaceutical

(NASDAQ: RARE)

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Consolidated Income Statement
($thousands, except per share data)

	FY 2012A	FY 2013A	Mar Q1 2014A	Jun Q2 2014A	Sep Q3 2014E	Dec Q4 2014E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E
Revenue															
KRN23 revenue booked by RARE	-	-	-	-	-	-	-	-	-	-	-	2,796	31,835	54,971	71,235
rhGUS revenue	-	-	-	-	-	-	-	-	-	617	13,962	32,172	47,022	51,206	56,812
Triheptanoin revenue	-	-	-	-	-	-	-	-	-	-	617	22,713	54,412	271,907	360,797
SA-ER revenue	-	-	-	-	-	-	-	-	-	-	953	5,245	13,248	21,653	29,562
Total product revenue	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 617**	**$ 15,532**	**$ 62,926**	**$ 146,517**	**$ 399,737**	**$ 518,406**
KRN23 U.S./Canada profit share/royalty	-	-	-	-	-	-	-	-	-	-	858	13,503	31,191	46,732	58,116
KRN23 E.U. royalty	-	-	-	-	-	-	-	-	-	-	-	883	6,020	14,594	20,562
SA-ER ex-U.S. royalty	-	-	-	-	-	-	-	-	-	-	25	124	298	525	721
Total profit share / royalty	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 883**	**$ 14,510**	**$ 37,510**	**$ 61,850**	**$ 79,399**
Total Revenue	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 617**	**$ 16,415**	**$ 77,436**	**$ 184,027**	**$ 461,587**	**$ 597,805**
COGS	-	-	-	-	-	-	-	-	-	100	10,739	2,160	14,343	49,380	70,805
Gross profit	-	-	-	-	-	-	-	-	-	517	5,676	75,275	169,684	412,207	527,000
Operating expense															
R&D (GAAP)	12,641	27,829	8,353	11,239	13,199	14,445	47,236	67,652	86,232	95,923	102,332	109,223	116,232	123,523	130,223
SG&A (GAAP)	3,344	4,451	1,986	2,422	2,599	3,111	10,118	14,321	17,388	22,555	27,017	29,765	32,888	35,774	38,675
Stock-based compensation	891	657	795	946	1,002	1,123	3,866	5,669	7,223	8,002	9,102	10,099	11,092	12,526	14,002
Total operating expense (GAAP)	15,985	32,280	10,339	13,661	15,798	17,556	57,354	81,973	103,620	118,478	129,349	138,988	149,120	159,297	168,898
Operating income (loss)	**(15,985)**	**(32,280)**	**(10,339)**	**(13,661)**	**(15,798)**	**(17,556)**	**(57,354)**	**(81,973)**	**(103,620)**	**(117,961)**	**(123,673)**	**(63,713)**	**20,564**	**252,910**	**358,102**
Interest income	1	216	93	149	176	190	608	657	1,662	1,841	1,923	1,190	1,167	3,441	9,033
Interest expense	-	-	-		-	-	-	-	-	-	-	-	-	-	-
Other income (expense), net	(350)	(3,006)	(3,384)	(73)	(73)	(73)	(3,603)	(3,603)	-	-	-	-	-	-	-
Total other (expense) income, net	(349)	(2,790)	(3,291)	76	103	117	(2,995)	(2,946)	1,662	1,841	1,923	1,190	1,167	3,441	9,033
Net gain (loss) before taxes	**(16,334)**	**(35,070)**	**(13,630)**	**(13,585)**	**(15,695)**	**(17,439)**	**(60,349)**	**(84,919)**	**(101,958)**	**(116,120)**	**(121,750)**	**(62,522)**	**21,730**	**256,351**	**367,135**
Income Tax Provision	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,357
Net income (loss) attributable to common stockholders	**$ (19,561)**	**$ (42,338)**	**$ (18,438)**	**$ (13,585)**	**$ (15,695)**	**$ (17,439)**	**$ (65,157)**	**$ (89,727)**	**$ (101,958)**	**$ (116,120)**	**$ (121,750)**	**$ (62,522)**	**$ 21,730**	**$ 256,351**	**$ 348,778**
EPS (basic and diluted)	**$ (14.20)**	**$ (11.25)**	**$ (0.85)**	**$ (0.45)**	**$ (0.47)**	**$ (0.55)**	**$ (2.23)**	**$ (2.77)**	**$ (2.94)**	**$ (3.13)**	**$ (3.25)**	**$ (1.65)**	**$ 0.56**	**$ 6.39**	**$ 8.52**
Weighted shares outstanding diluted	1,377	3,763	21,582	30,056	33,077	31,971	29,172	32,373	34,702	37,049	37,419	37,793	38,960	40,137	40,933

Margin Analysis:

Cost of goods sold	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16%	69%	3%	10%	12%	14%
KRN23	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	3%	4%	15%	17%
rhGUS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0%	1%	2%	14%	16%	18%
Triheptanoin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0%	3%	4%	9%	11%	12%
SA-ER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0%	9%	10%	12%	14%	18%
Gross margin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	31%	97%	90%	88%	86%
R&D (GAAP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	623%	141%	63%	27%	22%
SG&A (GAAP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	165%	38%	18%	8%	6%
Total operating expense	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	788%	179%	81%	35%	28%
Operating margin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	55%	60%
Income tax provision	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%
Net margin (GAAP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	56%	58%

Y/Y change:

Total revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2559%	372%	138%	151%	30%
KRN23 revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1039%	73%	30%
rhGUS revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2161%	130%	46%	9%	11%
Triheptanoin revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3584%	140%	400%	33%
SA-ER revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	450%	153%	63%	37%
Total profit share / royalty	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1544%	159%	65%	28%
KRN23 U.S. / Canada profit share / royalty	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1474%	131%	50%	24%
KRN23 E.U. royalty	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	582%	142%	41%
SA-ER ex-U.S. royalty	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	395%	141%	76%	37%
R&D (GAAP)	168%	120%	N/A	N/A	N/A	N/A	70%	43%	27%	11%	7%	7%	6%	6%	5%
SG&A (GAAP)	81%	33%	N/A	N/A	N/A	N/A	127%	42%	21%	30%	20%	10%	10%	9%	8%
Total operating expense	144%	102%	N/A	N/A	N/A	N/A	78%	43%	26%	14%	9%	7%	7%	7%	6%
Operating income	144%	102%	N/A	N/A	N/A	N/A	78%	43%	26%	14%	5%	-48%	-132%	1130%	42%
Net income (loss)	162%	116%	N/A	N/A	N/A	N/A	54%	38%	14%	14%	5%	-49%	-135%	1080%	36%
GAAP EPS (diluted)	208%	-21%	N/A	N/A	N/A	N/A	-80%	24%	6%	7%	4%	-49%	-134%	1045%	33%
Shares outstanding - GAAP	-15%	173%	N/A	N/A	N/A	N/A	675%	11%	7%	7%	1%	1%	3%	3%	2%

Sources: Company reports, STRH Research

Company Description

Ultragenyx is developing therapies for ultra-rare diseases, with 4 drugs in development for 5 different indications. The company focuses on identification, acquisition, development, and commercialization of new products for the treatment of ultra-rare diseases with a focus on metabolic, genetic and under-served diseases.

Investment Thesis

RARE boasts a portfolio of mid- to late-stage clinical assets to tackle genetic ultra-orphan diseases. With 4 clinical stage therapies developed for 5 indications, we anticipate a slew of data catalysts in 2015, with potential product approvals in 2017/18. **Physician feedback suggests all programs have good clinical probabilities of success.**

Valuation and Risks

Valuation:

We arrive at our 12-month price target of $82 by means of a sum-of-the-parts discounted cash flow analysis, which ascribes $23.60/share to KRN23, $8.10/share to rhGUS, $42.90/share to triheptanoin, $2.00/share to SA-ER and $5.72/share in cash, with the following assumptions: we assign KRN23 a 75% probability of success, rhGUS an 85% probability of success, triheptanoin a 60% probability of success and SA-ER a 50% probability of success. We assign a discount rate of 10% to KRN23, triheptanoin, and SA-ER, and a 9% discount rate to rhGUS. We assume a 2% terminal growth rate for KRN23, triheptanoin, and SA-ER, and a 3% terminal growth rate for rhGUS

The primary investment risks for Ultragenyx include the following:

- Clinical development risk: There is some uncertainly as to whether earlier stage experiments (preclinical, Phase I, or historical case reports) will translate into efficacy in Phase III.
- Regulatory risk: Even upon successful clinical data, the FDA may not view the results as worthy of regulatory approval for commercial sale. In particular, we highlight the risk of the FDA not accepting certain biomarker endpoints for the accelerated approval pathway.
- Commercial risk: Each product may fail to achieve revenues in line with our peak estimates in the commercial market.
- Competitive risk: The emergence of competing therapies may reduce Ultragenyx's market share.
- Partnership risk: Ultragenyx relies on partnerships for some of its therapies, KRN23 in particular. KHK manufactures and will commercialize the product in the E.U., thus Ultragenyx is vulnerable to shortcomings of their partners.
- Management risk: Ultragenyx has assembled a team of all-stars from the rare disease world, especially the CEO, Emil Kakkis. If certain employee were to leave at inopportune times, it may damage the company's chances of success.
- Financing risk: As a development stage company, Ultragenyx is not profitable and may not turn profitable in the near future. Future financings may be required to develop drugs, which may dilute existing shareholders.

Companies Mentioned in This Note

Alexion Pharmaceuticals, Inc. (ALXN, $159.46, Buy)
BioMarin Pharmaceutical Inc. (BMRN, $67.27,)
Ultragenyx Pharmaceutical, Inc. (RARE, $44.51, Buy)
Shire plc (SHPG, $244.57, Neutral)
Shire (SNY - $52.25 - NR)
Amgen (AMGN - $132.20 - NR)
bbVie (ABBV - $54.13 - NR)

Analyst Certification

I, Salveen Richter , hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company(ies) and its (their) securities. I also certify that I have not been, am not, and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation(s) in this report.

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SunTrust Robinson Humphrey, Inc. makes a market in the following companies at the time of this report: ALXN, BMRN, RARE, RARE-US, SHPG

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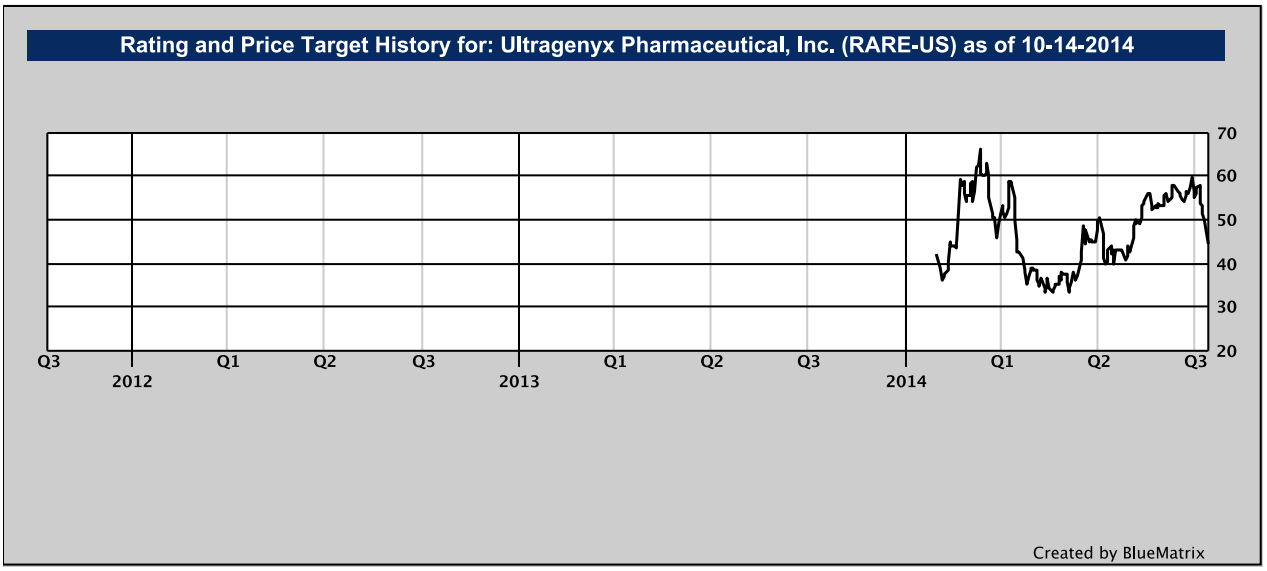

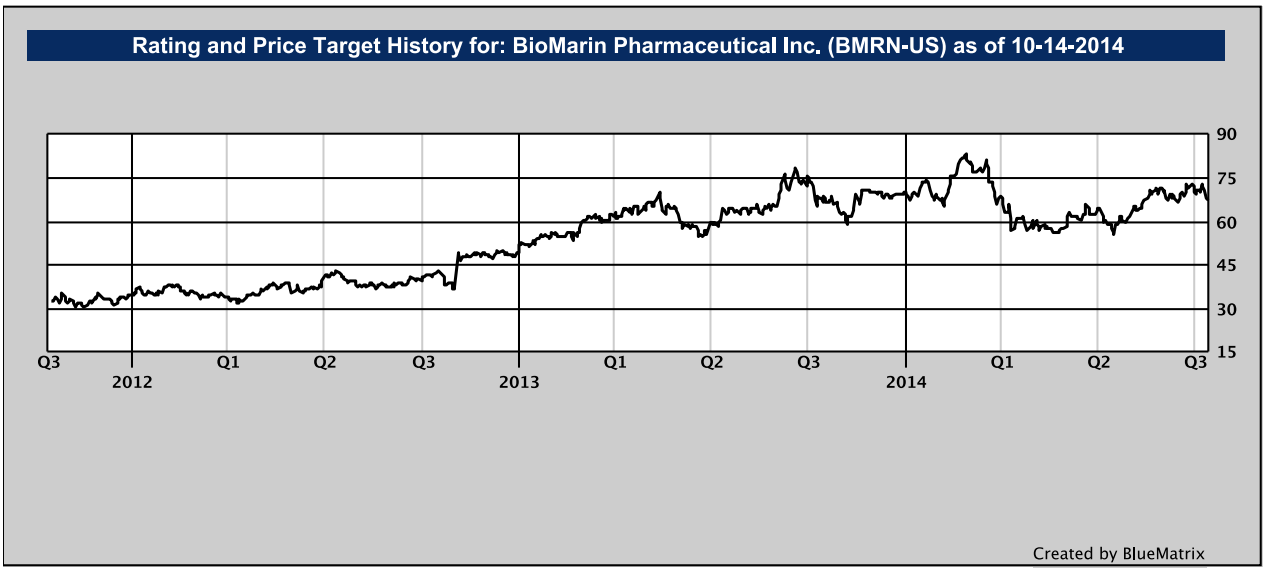

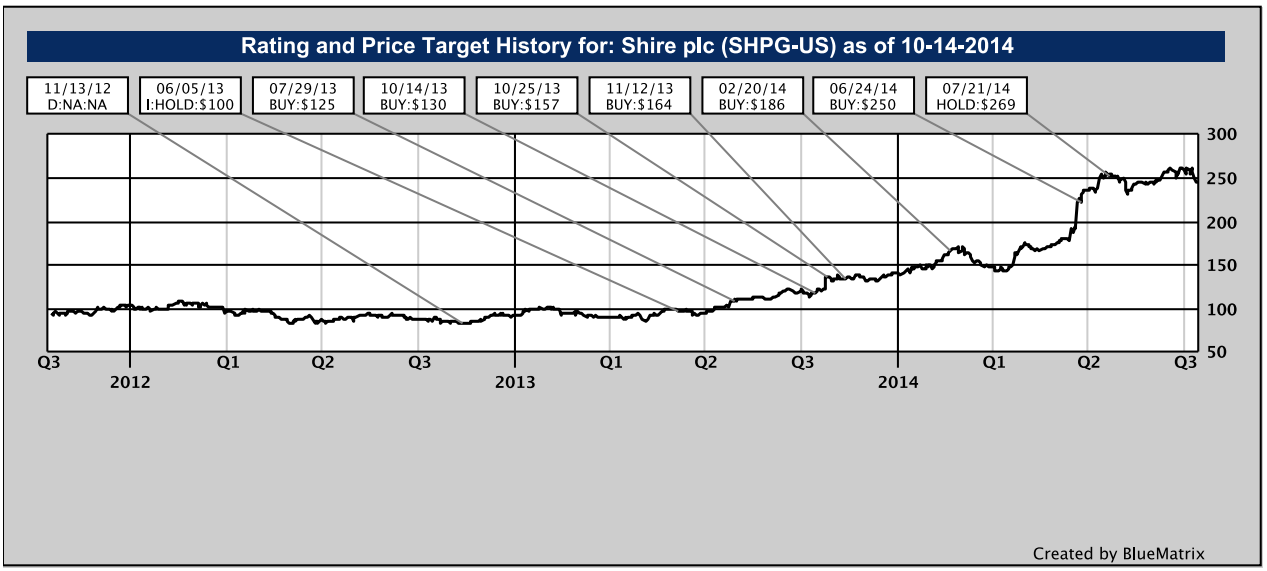

STRH Ratings System for Equity Securities

3 designations based on total returns* within a 12-month period**

- **Buy** – total return ≥ 15% (10% for low-Beta securities)***
- **Reduce** – total return ≤ negative 10% (5% for low Beta securities)
- **Neutral** – total return is within the bounds above
- **NR** – NOT RATED, STRH does not provide equity research coverage
- **CS** – Coverage Suspended

*Total return (price appreciation + dividends)
**Price targets are within a 12-month period, unless otherwise noted
***Low Beta defined as securities with an average Beta of 0.8 or less, using Bloomberg's 5-year average Beta

Legend for Rating and Price Target History Charts:
D = drop coverage
I = initiate coverage
T = transfer coverage

SunTrust Robinson Humphrey ratings distribution (as of 10/15/2014):

Coverage Universe			Investment Banking Clients Past 12 Months		
Rating	**Count**	**Percent**	**Rating**	**Count**	**Percent**
Buy	266	53.31%	Buy	76	28.57%
Neutral	226	45.29%	Neutral	41	18.14%
Sell/Reduce	7	1.40%	Sell/Reduce	0	0.00%

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