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Ultragenyx Pharmaceutical

Biotechnology

US Equity Research
7 January 2015

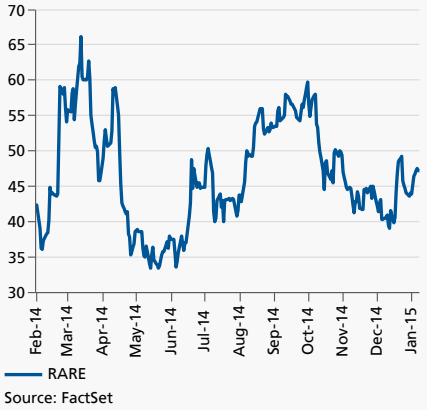
BUY

PRICE TARGET US$60.00
Price (6-Jan) US$47.10
Ticker RARE-NASDAQ

52-Week Range (US$):	32.02 - 69.77
Avg Daily Vol (000s) :	271.1
Shares Out. (M) :	31.9
Market Cap (US$M):	1,502

FYE Dec	2013A	2014E	2015E	2016E
Sales (US$M)	0.0	0.0	0.0	0.0
Net Income (US$M)	(50.3)	(60.1)	(72.6)	(93.0)
EPS Dil (US$)	(14.87)	(1.87)	(1.94)	(2.43)

Quarterly EPS Dil	Q1	Q2	Q3	Q4
2013A	-	-	-	-
2014E	(0.85)A	(0.45)A	(0.50)A	(0.53)
2015E	-	-	-	-
2016E	-	-	-	-



Source: FactSet

Ultragenyx is focused on developing and commercializing a broad pipeline of biologics and small molecules for the treatment of rare and ultra-rare serious metabolic genetic diseases.

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Initiation of Coverage

Emerging orphan play with multiple 2015 catalysts

We are initiating coverage on Ultragenyx Pharmaceuticals with a BUY rating and a $60 price target. With a promising and diverse pipeline that includes five clinical programs focused on rare diseases, an outstanding management team with a strong track record in the orphan space, and three key P2 data readouts expected this year, Ultragenyx is well positioned for 2015 upside, in our view. The company's two primary value drivers, KRN23 for genetic low serum phosphorus (XLH) and triheptanoin for two metabolic disorders (LC-FAOD and Glut1 DS), target highly unmet medical needs and address $1B WW total market opportunities. Additional pipeline candidates (SA-ER and rhGUS) target smaller opportunities but add to pipeline diversity and have the potential to provide meaningful impact to revenue and EPS when leveraged into a focused, rare disease sales force. The CEO is a key asset (former BioMarin CMO) with deep academic/industry connections.

- **2015 holds potential for significant value creation:** In 2H15, we expect three P2 data readouts for Ultragenyx' two primary pipeline assets, KRN23 and triheptanoin. We think positive data reads could significantly de-risk these pipeline assets and act as meaningful catalysts for Ultragenyx shares.
- **KRN23 P2 data in pediatric patients expected 2H15:** We estimate peak KRN23 sales in the XLH pediatric population at >$600M. Previously announced positive P1/2 results in the adult population demonstrated increases in markers of bone remodeling. Given the high turnover and growth of bone during childhood, the adult patient results increase our confidence in the potential for a positive outcome in the pediatric P2 trial.
- **P2 thriheptanoin data in Glut1 DS in 2H15:** We estimate peak WW sales of thriheptanoin in Glut1 DS of ~$600M. Ultragenyx recently broadened the P2 enrollment criteria to include only patients with absence seizures. This decision was based on positive results from an independent study published in *JAMA,* which showed that food-grade triheptanoin decreased absence seizure rates in Glut1 DS patients. Including only absence seizure patients in the P2 increases the probability of a positive outcome, since proof of concept has already been established in this population.
- **Triheptanoin P2 LC-FAOD data in 2H15:** We estimate WW peak sales for triheptanoin in LC-FAOD of ~$300M. The primary goal of the P2 is to identify the appropriate patient population and clinical endpoints for pivotal studies, so Street expectations will likely be tempered. That said, any positive effects on skeletal myopathy, hepatic disease, and/or cardiac parameters could surprise the Street.
- **Valuation/risks:** Our 12-month $60 price target is justified by a discounted EPS valuation. Primary risks include clinical trial failures, regulatory risks, lack of market acceptance, reimbursement and competition.

Investment thesis

We are initiating coverage on Ultragenyx Pharmaceuticals with a BUY rating and a price target of $60. We view Ultragenyx as an emerging rare disease play with an intriguing pipeline, excellent management, solid balance sheet, and multiple 2015 catalysts. Ultragenyx's promising and diverse pipeline includes five clinical programs focused on rare diseases that we feel, in aggregate, have the potential to yield $1B+ in revenues to the company. The management team has a proven track record of success in the orphan space. Founder and CEO Dr. Emil Kakkis, who previously worked for 10+ years at BioMarin, ultimately as CMO, has extensive knowledge of the rare disease space and deep academic and industry relationships. His background and experience provide us with confidence in the company's strategic direction and execution potential. In 2015, we expect three key P2 data readouts, each of which has the potential for significant value creation. The company's two primary value drivers, KRN23 for XLH and triheptanoin for both LC-FAOD and Glut1 DS, each target highly unmet medical needs and $1B total WW addressable market opportunities. Additional pipeline candidates SA-ER (HIBM) and rhGUS (MPS 7) target smaller opportunities, but add to pipeline diversity and have the potential to provide meaningful impact to revenue and EPS when leveraged into a focused, rare disease sales force. In our view, 2015 holds potential for significant value creation for Ultragenyx shareholders, with three P2 data readouts for the company's two primary pipeline assets, KRN23 and triheptanoin. Positive data reads could significantly de-risk these pipeline assets and act as meaningful catalysts for Ultragenyx shares.

KRN23 P2 pediatric data in 2H15 – P1/2 adult results increases our optimism for positive peds data

KRN23 is a monoclonal antibody in P2 development targeting fibroblast growth factor 23 (FGF23) for the treatment of X-linked hypophosphatemia (XLH). XLH is a rare genetic disease that impairs bone growth, affecting ~12,000 patients in the US alone (~9k adults and ~3k peds). There is no approved drug therapy or treatment for the underlying cause of XLH and current standard of care (oral phosphate and/or Vitamin D) is cheap, but sub-optimal (6x/day = low compliance; poor tolerance; low impact on bones and growth; high risk of nephrocalcinosis). Ultragenyx launched a US/EU P2 study in pediatric patients in June 2014 with data expected in 2H15. While adults make up the majority of XLH patients, they often have less severe disease. Therefore, we believe the pediatric indication represents the larger market opportunity for KRN23, given the high morbidity and the potential benefit an effective treatment could offer. We expect pivotal trials (adult P2b & peds P3 open-label) to be initiated in 1H15 and 2016, respectively, and approval and launch in FY19. KRN23 has orphan drug designation in both the US and EU. We estimate peak WW sales potential in the combined adult/peds population of $1+ billion and peak KRN23 sales in the pediatric population at >$600M. Previously announced positive P1/2 results in the adult population demonstrated increases in markers of bone remodeling. Given the high turnover and growth of bone during childhood, the adult patient results increase our confidence in the potential for a positive outcome in the pediatric P2 trial, with data expected in 2H15.

P2 triheptanoin data in Glut1 DS in 2H15 – Enriched P2 population increases chances of success

Triheptanoin is in a P2 study for the treatment of glucose transporter type-1 deficiency syndrome (Glut1 DS), a rare metabolic disease in which a glucose transport defect causes brain energy deficiency. Glut1 DS is characterized by seizures, developmental delay, and movement disorder. There are no approved drugs for Glut1 DS at present.

The current SOC is the ketogenic diet in combination with one or more antiepileptic drugs. A ketogenic diet is an extreme high-fat/low-carbohydrate diet in which patients derive up to 90% of their daily calories from fat. This special diet is designed to force the liver to convert fat into fatty acids and ketone bodies. Ketone bodies can cross the blood-brain barrier and serve an alternative fuel source to glucose. While ketogenic diets may help reduce seizure frequency, compliance presents a major challenge. In addition, these diets have marginal effects on developmental delay and movement disorders, and can cause kidney stones. There are no antiepileptic drugs (AEDs) approved specifically for patients with Glut 1 DS, and only ~10% of Glut1 DS patients achieve seizure control on these drugs alone. We estimate peak WW sales of triheptanoin in Glut1 DS of ~$600M. Ultragenyx recently broadened the P2 enrollment criteria to include only patients with absence seizures. This decision was based on positive results from an independent study published in *JAMA*, which showed that food-grade triheptanoin decreased absence seizure rates in Glut1 DS patients. Including only absence seizure patients in the P2 increases the probability of a positive outcome, in our view, since POC has already been established in this population.

Triheptanoin LC-FAOD P2 data in 2H15 – low Street expectations could yield surprise

Patients with LC-FAOD have a mitochondrial enzyme deficiency that results in an inability to use long chain fatty acids as an energy source. This can lead to depletion of glucose in the body and severe damage to the liver, muscles, and heart. Severe energy crises in LC-FAOD patients can result in significant morbidity and even death. Ultragenyx is developing triheptanoin as a substrate replacement therapy that serves an alternative energy source to long-chain fatty acids. No drugs or treatments are currently approved for LC-FAOD. We estimate WW peak sales for triheptanoin in LC-FAOD of ~$300M. The primary goal of the ongoing exploratory P2 is to identify the appropriate patient population and clinical endpoints for pivotal studies, so Street expectations will likely be tempered. That said, any positive effects on skeletal myopathy, hepatic disease, and/or cardiac parameters could surprise the Street.

Strong balance sheet

As of 3Q14, Ultragenyx had ~$200M in cash and no debt. The company believes current cash should be sufficient to fund operations through 2016.

Valuation/risks

Our $60 price target is justified by a discounted EPS valuation. We apply a 35x multiple to our FY23 EPS estimate of $10.23 discounted back to YE15 at 25%. We use a 35x multiple since EPS growth is estimated to be 40% in FY23. Our 25% discount rate reflects clinical, regulatory, and commercial risks. Primary risks include: clinical trial failures, regulatory risks, lack of market acceptance for approved products, reimbursement risks, and competitive risks.

Figure 1: Valuation table

Discount Rate	P/E Multiples						
	29.0x	31.0x	33.0x	35.0x	37.0x	39.0x	41.0x
19.0%	$ 73.68	$ 78.76	$ 83.84	$ 88.92	$ 94.01	$ 99.09	$ 104.17
21.0%	64.48	68.93	73.38	77.83	82.27	86.72	91.17
23.0%	56.56	60.46	64.36	68.26	72.16	76.06	79.96
25.0%	49.71	53.14	56.57	**$ 60.00**	63.43	66.86	70.28
27.0%	43.79	46.81	49.83	52.85	55.87	58.88	61.90
29.0%	38.64	41.31	43.97	46.64	49.30	51.97	54.63
31.0%	34.17	36.52	38.88	41.24	43.59	45.95	48.31

Source: Canaccord Genuity estimates

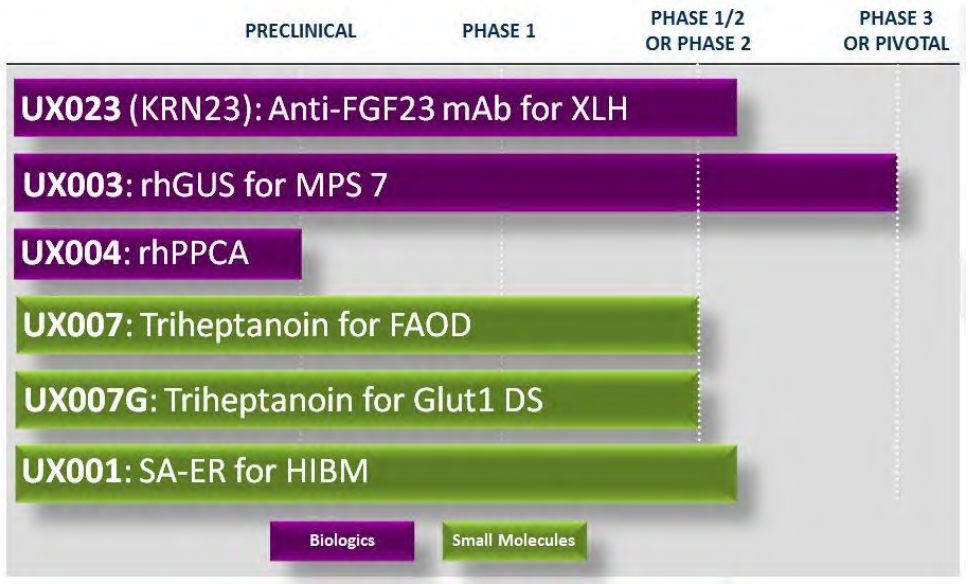
Figure 2: Sensitivity analysis

Implied EPS	P/E Multiples						
	29.0x	31.0x	33.0x	35.0x	37.0x	39.0x	41.0x
$ 9.31	$ 45.24	$ 48.36	$ 51.48	$ 54.60	$ 57.72	$ 60.84	$ 63.96
9.62	46.73	49.95	53.18	56.40	59.62	62.84	66.07
9.93	48.22	51.55	54.87	58.20	61.53	64.85	68.18
10.23	49.71	53.14	56.57	**$ 60.00**	63.43	66.86	70.28
10.54	51.21	54.74	58.27	61.80	65.33	68.86	72.39
10.85	52.70	56.33	59.97	63.60	67.23	70.87	74.50
11.15	54.19	57.93	61.66	65.40	69.14	72.87	76.61

Source: Canaccord Genuity estimates

Pipeline

Figure 3: Ultragenyx pipeline



Source: Company reports

Milestones

Figure 4: Upcoming milestones

Ultragenyx Expected Milestones			
Product	**Indication**	**Timing**	**Milestone**
KRN23	XLH	1H15	Phase 2b Adult Trial Initiation
		2H15	Phase 2 Interim 40-week Pediatric Data
		1Q16	Phase 2 Pediatric Final Data
Triheptanoin	LC-FAOD	2H15	Interim Phase 2 LC-FAOD Data
	Glut1 DS	2H15	Phase 2 Glut1 DS Data
rhGUS	MPS 7	Feb-15	Phase 1/2 36-week Data at LDN
		1H16	Phase 3 MPS 7 Data
SA-ER	HIBM	1H15	Phase 3 HIBM Initiation

Source: Canaccord Genuity Estimates

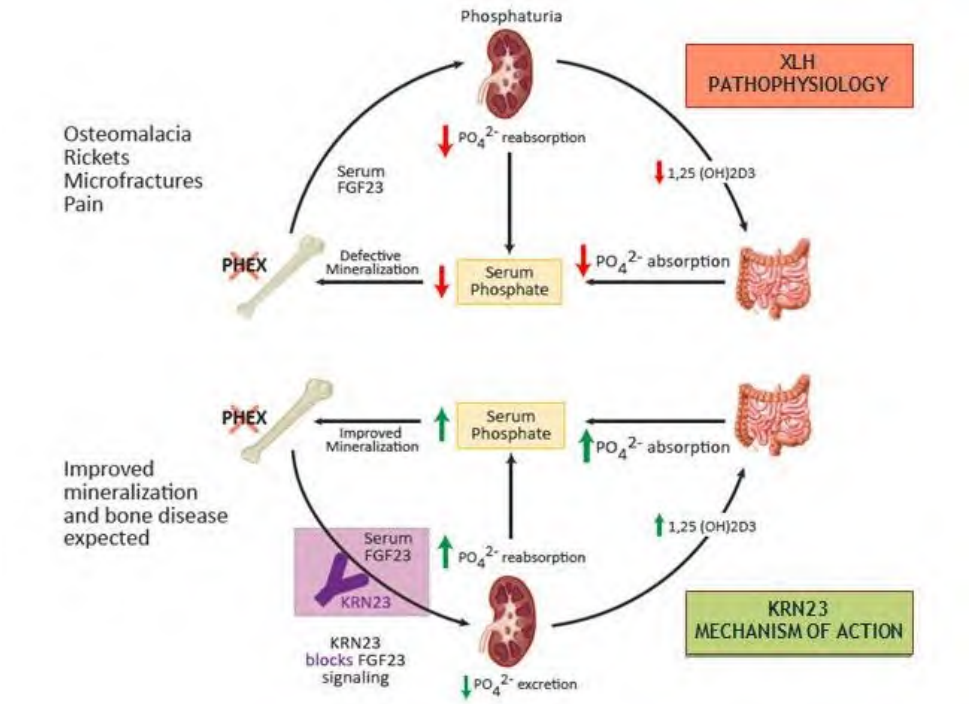
KRN23 (UX023)

KRN23 is a monoclonal antibody in P2 development targeting fibroblast growth factor 23 (FGF23) for the treatment of X-linked hypophosphatemia (XLH). XLH is a rare genetic disease that impairs bone growth, affecting ~12,000 patients in the US alone (~9k adults and ~3k peds). KRN23 works by binding to the phosphaturic hormone FGF23 and reducing its activity. This increases the abnormally low serum phosphate levels as well as Vitamin D, which should lead to better bone mineralization for XLH patients. There is no approved drug therapy or treatment for the underlying cause of XLH. Current standard of care (oral phosphate and/or Vitamin D) is cheap, but sub-optimal (6x/day = low compliance; poor tolerance; low impact on bones and growth; high risk of nephrocalcinosis). Ultragenyx launched a US/EU P2 study in pediatric patients in June 2014 with data expected in 2H15. While adults make up the majority of the XLH patients, they often have less severe disease. Therefore, we believe the pediatric indication represents the largest market opportunity for KRN23, given the high morbidity and potential benefit an effective treatment could offer. Ultragenyx is collaborating with Kyowa Hakko Kirin Co (KHK) to jointly develop and commercialize KRN23 in the US and EU. We expect pivotal trials (adult P2b & peds P3 open-label) to be initiated in 1H15 and 2016, respectively, and approval and launch in FY19. KRN23 has orphan drug designation both the US and EU. We estimate peak sales potential of $1+ billion.

Product overview

KRN23 is a recombinant fully human monoclonal (IgG1) antibody delivered by SC injection that targets fibroblast growth factor 23 (FGF23). FGF23 is a phosphaturic hormone produced in bone cells that plays a key role in phosphate homeostasis. P2 trials are underway in both pediatrics and adults XLH patients. XLH is a disease characterized by excess activity of FGF23, which causes the kidneys to increase renal phosphate excretion and to decrease vitamin D production. As a result, XLH patients have chronically low levels of serum phosphate due to loss into the urine, which leads to severe bone abnormalities and related complications. KRN23 binds and inhibits FGF23, producing the dual benefit of both restoring normal phosphate reabsorption from the kidney and increasing the production of vitamin D. Increased vitamin D enhances intestinal absorption of phosphate. Importantly, by knocking down FGF23 levels in the blood, KRN23 treats the underlying cause of the disease. There is no approved drug therapy or treatment for the underlying cause of XLH. Current standard of care (oral phosphate and/or Vitamin D) is cheap, but sub-optimal (6x/day = low compliance; low impact on bones and growth; high risk of nephrocalcinosis). KRN23, on the other hand, has the potential to normalize phosphate, improve growth velocity, increase stature, and straighten bones in these severely affected children. Ultragenyx entered into a collaboration and license agreement with KHK to develop and commercialize KRN23 in August 2013. Positive results were previously announced from a P1, a P1/2, and a P1/2 extension study of KRN23 in adults with XLH.

Figure 5: KRN23 mechanism of action



Source: Company reports

Disease background

XLH is an X-linked dominant disorder in which patients' bone cells secrete excess FGF23, a hormone that causes phosphate to be excreted in the urine. Urinary phosphate loss results in severe hypophosphatemia, poor bone mineralization, and related complications. The inadequate bone mineralization leads to a host of abnormalities, including: rickets, osteomalacia, bone pain, waddling gait, short stature, gross motor impairment, muscle weakness, osteopenia, frequent and poorly healing microfractures, spinal stenosis, enthesopathy, and osteoarthritis.

Figure 6: XLH clinical presentation

Source: Company reports

Diagnosis is primarily made on clinical presentation and confirmed by serum and urine phosphorus tests and x-rays. Average age of diagnosis for XLH is two years old. While adults make up the majority of XLH patients, they often have less severe disease. US prevalence is estimated at 3000 pediatric patients and 9000 adult patients, which reflects an estimated incidence of about 1 in 20,000.

In children, XLH is a very severe disease. These pediatric patients are severely deformed and impaired. Chronically low serum phosphate results in the inability to mineralize bone properly. As a result, these children are left with soft and weak bones.

XLH is the most common heritable form of rickets. Rickets is a disorder caused by a lack of vitamin D, calcium, or phosphate. In the case of XLH, low serum phosphorus is the primary cause. Rickets leads to softening and weakening of the bones and associated complications, including: bone pain, dental deformities, decreased muscle tone, progressive weakness, impaired growth, increased bone fractures, muscle cramps, short stature (< 5 feet tall), and skeletal deformities (i.e. characteristic bowlegs). As adults, these patients end up having osteomalacia, which is poorly mineralized bone and recurring microfractures, pain, weakness, and decreased mobility.

Most XLH patients are managed with oral phosphate replacement and vitamin D therapy, which is not FDA approved for the disease. While cheap and widely available, this treatment is both highly inconvenient and carries significant risks. Therapy requires dosing up to 6x/day, is poorly tolerated due to G.I. upset, and necessitates careful medical monitoring due to the risk of nephrocalcinosis (phosphate-calcium precipitates in the kidneys due to excessive spikes in phosphate levels). Nephrocalcinosis can severely damage the kidneys and, if not caught early, can lead to permanent damage and chronic kidney disease (CKD). The risk of nephrocalcinosis often prompts physicians to prescribe sub optimal doses of phosphate and vitamin D. In addition, while partially effective at reducing rickets, these treatments do not meaningfully improve growth, which is the ultimate goal of treatment.

While nearly all pediatric XLH patients are treated with oral phosphate, treatment in the adult population is more variable due to the risk of nephrocalcinosis. As a result, exactly how much of the adult population would be addressable with KRN23 remains uncertain. While adults with more severe disease are more likely to be candidates for treatment with KRN23, how individual physicians will define disease severity remains unclear. The ongoing P2b adult study should help clarify what adult penetration rates will ultimately prove to be. In the meantime, our model takes a somewhat conservative approach as detailed below.

Clinical data

Phase 1: Initial P1 results were presented in October 2013 at the American Society for Bone and Mineral Research (ASBMR) Annual Meeting and subsequently published in the Journal of Clinical Investigation in February 2014. The trial was a single dose study in 38 adult XLH patients. Results showed that KRN23 was well tolerated and increased serum phosphate as well as vitamin D levels. Of the 38 patients, 12 received a single SC injection (at doses of 0.1, 0.3, 0.6, or 1.0 mg/kg), 17 received a single IV injection (at doses of 0.003, 0.01, 0.03, 0.1, or 0.3 mg/kg) and nine received placebo. The SC and IV doses showed comparable effects on the increase in serum phosphate levels, but the time to reach peak effect was slower and duration of effect was greater with SC administration. Changes were observed in renal tubular reabsorption of phosphate as well as in increases in Vitamin D, suggesting improved intestinal absorption of both phosphate and calcium. Importantly, some patients were able to raise serum phosphate levels from ~1.7 into the low normal range of 3 to 3.5 mg/dL with a single SC injection of KRN23 and the observed effect was sustained out to one month. Equally as important, no changes were observed in serum calcium or PTH. No MTD was reached in the study. In addition, no anti-KRN23 anti-bodies or hypersensitivity or infusion reactions were observed. No SAEs were reported, although ~83% of patients experienced non-serious TEAEs. The most common TEAEs were nausea and headache (none with SC). In the SC cohort, two patients (~ 17%) experienced elevated levels of amylase in the blood, and two other patients (~ 17%) experienced back pain. Dose appeared unrelated to observed AEs.

Phase 2 (INT-001): In June 2014, Ultragenyx presented initial results from a P1/2 multiple-dose, dose-escalation study (INT-001) in 28 adult patients with XLH. Participants were given up to four escalating doses from 0.05 mg/kg to 0.6 mg/kg. The study was designed to assess the safety and tolerability of monthly SC injections of KRN23 SC.

Safety

The most common AEs were nasopharyngitis, joint pain, diarrhea, back pain, and restless leg syndrome. There were no SAEs related to treatment and no renal or cardiac tissue calcification observed. One patient discontinued treatment due to injection site reaction. No anti-KRN23 antibodies were observed.

Efficacy

Results of the trial demonstrated that patients treated with KRN23 showed increases in urinary phosphorus reabsorption, serum phosphorus levels, and 1,25 dihydroxy vitamin D levels. Repeat doses over four months led to an increase in serum phosphorus in 100% of patients, with ~89% reaching the low end of the normal range. Peak mean serum phosphorus increased to 3.03 ± 0.42 mg/dL after the fourth dose, an ~60% increase from the mean of 1.89 ± 0.33 mg/dL at baseline. Comparable increases were observed in mean reabsorption of phosphate from the urine (TmP/GFR) and mean serum 1,25 dihydroxy vitamin D levels.

Increases in markers of bone remodeling were also observed, including markers of bone formation and bone resorption. The increase in P1NP from baseline was statistically significant ($p < 0.05$) after all doses and the increase in osteocalcin was statistically significant ($p < 0.05$) after the fourth dose. Increases in BALP and CTx were also observed. These data support the hypothesis that improving serum phosphate levels will translate into improved bone remodeling, in our opinion.

Patients completed two QOL questionnaires at baseline and after the fourth dose. Mean scores improved for all SF-36v21 and WOMAC2 scales. For SF-36v2, statistically significant increases from baseline were observed in the role limitations due to physical health, bodily pain, and physical component summary scales. For WOMAC, statistically significant increases from baseline were observed in the physical functioning and stiffness scales. Stiffness is one of the major symptoms of XLH in adult patients.

Long term extension study (INT-002): In September 2014 at ASBMR, Ultragenyx announced positive 16-month results from a long-term P1/2 extension study of KRN23 in adult patients with XLH. The trial was an open label trial in which patients received monthly SC doses of KRN23 for a four-month dose escalation period (n=28) followed by a 12-month extension (n=22). The cumulative 16-month data combined the four-month dose escalation data from INT-001 and the 12-month extension data from INT-002. Results demonstrated that all KRN23-treated patients continued to show increases in serum phosphorus, while the majority maintained levels in the normal range over the cumulative 16-month treatment period. Partner KHK chose not to enroll patients into a long-term extension trial (perhaps due to a lack of experience in the rare disease space), but Ultragenyx is working to re-enroll some the trial patients into an OLE.

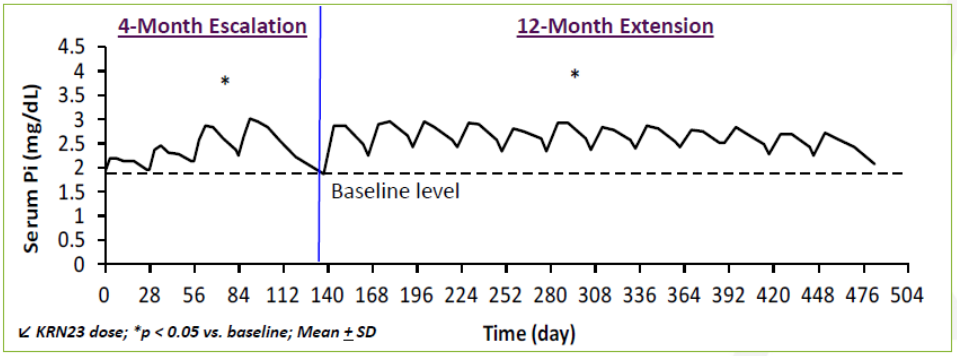
Safety

KRN23 was generally safe and well tolerated over the cumulative treatment period. The most common treatment-related AEs were nasopharyngitis, injection site reaction, joint/back pain, diarrhea, restless legs syndrome, headache, and upper abdominal pain. Two cases of decreased neutrophil count were observed during the study. Both had a lower neutrophil count at baseline and neither was associated with any significant infections. SAEs were reported in three subjects but were all considered

unrelated to KRN23. Three patients discontinued treatment due to: injection site reaction (n=1), nephrolithiasis, and one restless legs syndrome. No significant changes were observed in PTH or serum calcium. Mild and intermittent hypercalcemia was observed in two subjects, and transient hypercalciuria was seen in three patients. No anti-KRN23 antibodies were detected, which is important since KRN23 will be used chronically, if approved.

Efficacy

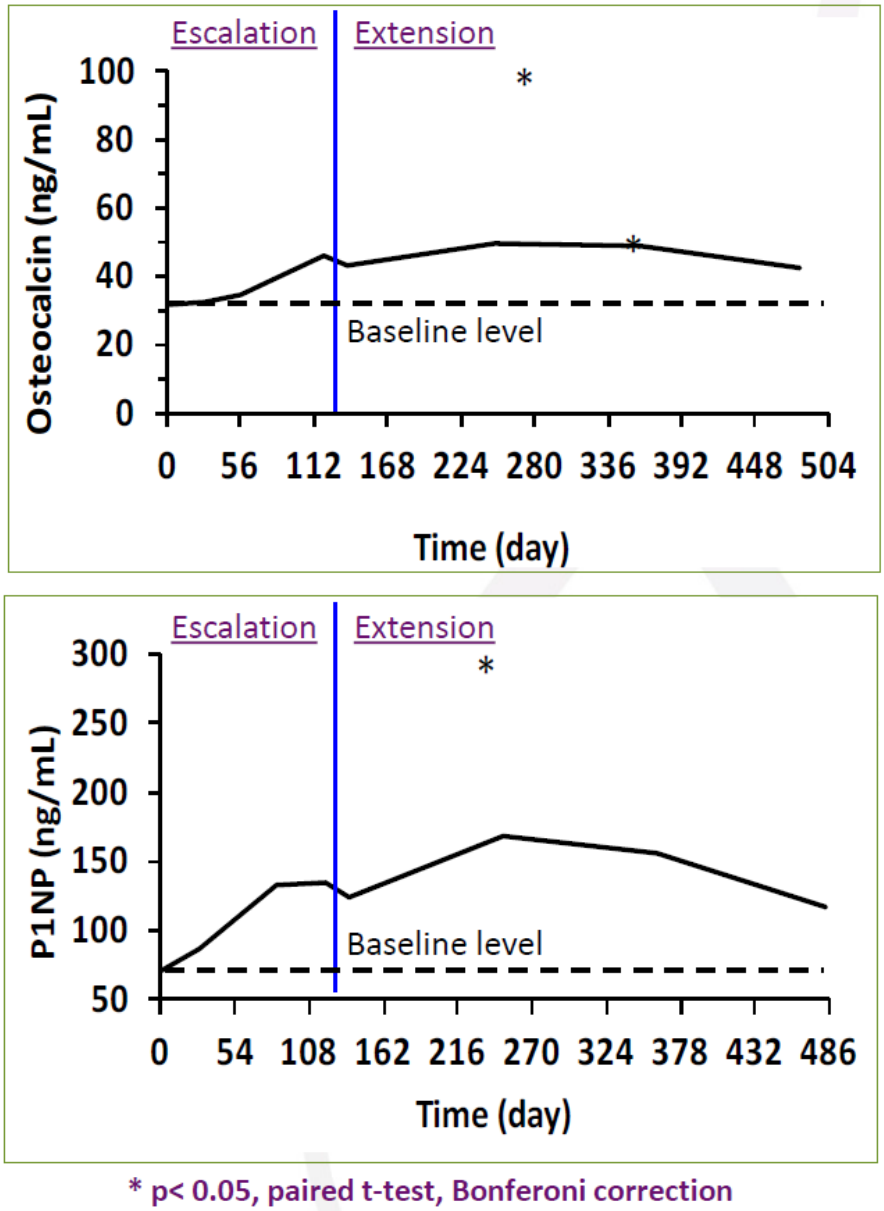
Figure 7: KRN23 P1/2 long-term extension study results



Source: Company reports

Results demonstrated that the increases in serum phosphorus levels, renal tubular reabsorption of phosphate, and serum vitamin D levels observed in the initial INT-001 study were generally sustained during the extension. All patients continued to demonstrate increases in serum phosphorus levels, and approximately 53%-86% had serum phosphorus levels that reached the normal range (2.5 to 4.5 mg/dL) at peak time on Day 7 or Day 14 after each dose over the 12-month extension. The mean increases in markers of bone remodeling (P1NP and osteocalcin) observed in INT-001 were also generally sustained (see below). The study was run by Ultragenyx's partner and, unfortunately, was not designed to include any radiographic assessments.

Figure 8: Increases in bone remodeling markers maintained over additional 12-months

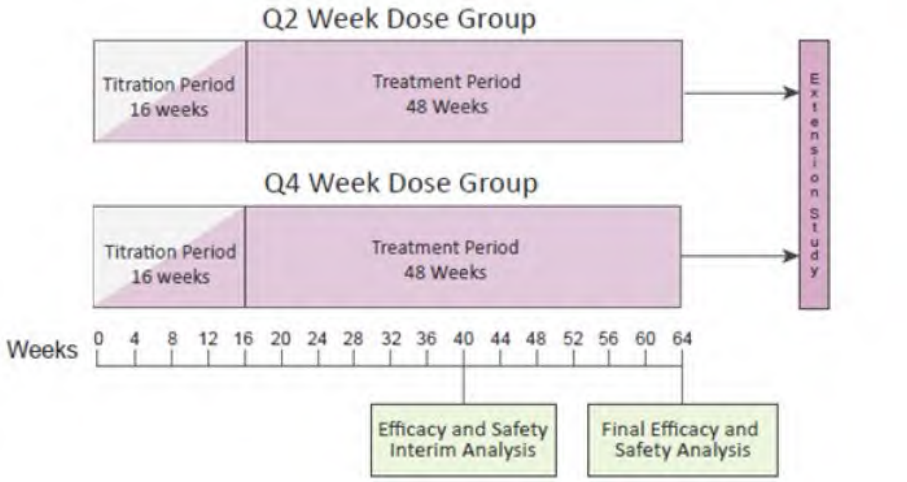


Source: Company reports

Even though this was an open label study, we view these data as encouraging as they demonstrate KRN23 increases phosphate to the low normal range and improves metabolic turnover and QOL (pain and stiffness).

Given the high turnover and bone growth during childhood coupled with the critical role phosphate plays in bone growth, pediatric XLH patients have the highest morbidity and potential to benefit from KRN23 in a short timeframe. This view is supported by results from studies with a separate enzyme replacement therapy (teriparatide) in treating hypophosphatasia, a different bone disease than XLH that also affects both children and adults.

Figure 9: P2 Pediatric trial - ongoing



Source: Company reports

In July 2014, Ultragenyx announced the initiation of a 30-patient P2 study of KRN23 in pediatric XLH, and target enrollment was reached in November 2014. The US/EU trial is a 64-week, multi-center, randomized, open-label, dose-finding study to evaluate safety and efficacy in ~30 pediatric XLH patients between the ages of five and 12. The primary objectives are dose and dosing regimen identification, serum phosphorus levels, and safety. Clinical effects will be assessed on bone health and deformity (x-ray assessment of healing of rickets in the wrists and knees per Thacher Radiographic Scoring Method), increase in height, muscle strength, and motor function. Importantly, radiographic scoring of rickets and growth are key endpoints that the FDA has indicated can be used in a pivotal study. In addition, the study will evaluate markers of bone health and patient-reported outcomes of pain, disability, and QOL.

The study consists of a 16-week period of individual SC dose-titration followed by 48-weeks of treatment. The 16-week dose-titration period will identify individualized doses of KRN23 required to achieve stable serum phosphorus levels in the target range. Patients will be divided into three cohorts of escalating starting dose levels with either monthly or biweekly dosing regimens. At the end of the dose-titration period, patients will receive their individually-optimized dose of KRN23 on a monthly or biweekly basis for the 48-week treatment period. An interim analysis of safety and PD data will be conducted after 24 weeks of the treatment period (40 weeks after initial dosing in the titration period).

We expect the interim 40-week data in 2H15 and final study results in 1Q16.

Development status

Partner KHK has completed one P1 study, one P1/2 study, and one longer-term P1/2 study of KRN23 in adults with XLH. In July 2014, Ultragenyx initiated a P2 study of KRN23 in pediatric patients with XLH.

Ultragenyx intends to initiate a randomized, placebo-controlled adult Phase 2b study in 1H15. According to the company, the adult study will likely assess microfractures and other aspects of bone disease, in addition to muscle function, which is abnormal in these patients.

The goal would be to have the adult P2b the pediatric P3 studies mature at approximately the same time. This would allow a single registration filing to cover the entire population of treatable patients. The combination of the pediatric bone disease

data and the adult bone and muscle disease data would be the basis for the filing package.

For the pivotal pediatric study, the FDA has indicated that either blinded radiographic assessments (central blinded reading) of changes in bone abnormalities (i.e. rickets and bowing) or changes in growth may be used as a primary endpoint. The FDA also blessed an open-label P3 study, but recommended inclusion of a SOC control arm for comparison on a non-inferiority basis. The final P3 design will be determined once sufficient safety and efficacy data are available and after further consultation with the FDA.

Figure 10: Revenue model

KRN23 Revenue Model

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
US XLH Pediatric Build															
XLH US Peds Population	3000	3060	3121	3184	3247	3312	3378	3446	3515	3515	3515	3515	3515	3515	3515
Penetration Rate	*1%*	*10%*	*20%*	*30%*	*40%*	*50%*	*55%*	*60%*	*60%*	*60%*	*60%*	*60%*	*60%*	*60%*	*60%*
# Treated	30	306	624	955	1299	1656	1858	2068	2109	2109	2109	2109	2109	2109	2109
KRN23 Cost/Yr	100000	102000	104040	106121	108243	110408	112616	114869	117166	117166	117166	117166	117166	117166	117166
Total US Peds Sales ('000)	$ 3,000	$ 31,212	$ 64,946	$ 101,355	$ 140,599	$ 182,849	$ 209,260	$ 237,506	$ 247,101	$ 247,101	$ 247,101	$ 247,101	$ 247,101	$ 247,101	$ 247,101
US XLH Adult Build															
XLH US Adult Population	9000	9180	9364	9551	9742	9937	10135	10338	10545	10545	10545	10545	10545	10545	10545
Penetration Rate	*1%*	*5%*	*8%*	*10%*	*12%*	*14%*	*16%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*	*18%*
# Treated	45	459	749	955	1169	1391	1622	1861	1898	1898	1898	1898	1898	1898	1898
KRN23 Cost/Yr	100000	102000	104040	106121	108243	110408	112616	114869	117166	117166	117166	117166	117166	117166	117166
Total US Adult Sales ('000)	$ 4,500	$ 46,818	$ 77,935	$ 101,355	$ 126,539	$ 153,593	$ 182,627	$ 213,756	$ 222,391	$ 222,391	$ 222,391	$ 222,391	$ 222,391	$ 222,391	$ 222,391
Total KRN23 US Sales	**$ 7,500**	**$ 78,030**	**$ 142,881**	**$ 202,709**	**$ 267,138**	**$ 336,442**	**$ 391,887**	**$ 451,262**	**$ 469,493**	**$ 469,493**	**$ 469,493**	**$ 469,493**	**$ 469,493**	**$ 469,493**	**$ 469,493**
Profit Share with KHK	50%	50%	50%	50%	50%	25%	28%	28%	28%	28%	28%	28%	28%	28%	28%
US Revenue to Ultragenyx ('000)	**$ 3,750**	**$ 39,015**	**$ 71,441**	**$ 101,355**	**$ 133,569**	**$ 84,111**	**$ 109,728**	**$ 126,353**	**$ 131,458**	**$ 131,458**	**$ 131,458**	**$ 131,458**	**$ 131,458**	**$ 131,458**	**$ 131,458**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
EU XLH Pediatric Build															
XLH EU Peds Population	5000	5100	5202	5306	5412	5520	5631	5743	5858	5858	5858	5858	5858	5858	5858
Penetration Rate	*0%*	*8%*	*16%*	*22%*	*28%*	*32%*	*36%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*
# Treated	0	408	832	1167	1515	1767	2027	2297	2343	2343	2343	2343	2343	2343	2343
KRN23 Cost/Yr	100000	102000	104040	106121	108243	110408	112616	114869	117166	117166	117166	117166	117166	117166	117166
Total EU Peds Sales ('000)	$ -	$ 41,616	$ 86,595	$ 123,878	$ 164,032	$ 195,039	$ 228,284	$ 263,896	$ 274,557	$ 274,557	$ 274,557	$ 274,557	$ 274,557	$ 274,557	$ 274,557
EU XLH Adult Build															
XLH EU Adult Population	15000	15300	15606	15918	16236	16561	16892	17230	17575	17575	17575	17575	17575	17575	17575
Penetration Rate	*0%*	*3%*	*5%*	*8%*	*11%*	*14%*	*16%*	*16%*	*16%*	*16%*	*16%*	*16%*	*16%*	*16%*	*16%*
# Treated	0	459	780	1273	1786	2319	2703	2757	2812	2812	2812	2812	2812	2812	2812
KRN23 Cost/Yr	100000	102000	104040	106121	108243	110408	112616	114869	117166	117166	117166	117166	117166	117166	117166
Total EU Adult Sales ('000)	$ -	$ 46,818	$ 81,182	$ 135,139	$ 193,324	$ 255,989	$ 304,378	$ 316,675	$ 329,469	$ 329,469	$ 329,469	$ 329,469	$ 329,469	$ 329,469	$ 329,469
Total KRN23 EU Sales	**$ -**	**$ 88,434**	**$ 167,777**	**$ 259,017**	**$ 357,356**	**$ 451,028**	**$ 532,662**	**$ 580,571**	**$ 604,026**	**$ 604,026**	**$ 604,026**	**$ 604,026**	**$ 604,026**	**$ 604,026**	**$ 604,026**
Royalty from KHK (up to 10%)	5%	5%	6%	8%	9%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
EU royalty to Ultragenyx ('000)	**$ -**	**$ 4,422**	**$ 10,067**	**$ 20,721**	**$ 32,162**	**$ 45,103**	**$ 53,266**	**$ 58,057**	**$ 60,403**	**$ 60,403**	**$ 60,403**	**$ 60,403**	**$ 60,403**	**$ 60,403**	**$ 60,403**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ROW XLH Pediatric Build															
XLH ROW Peds Population	5000	5100	5202	5306	5412	5520	5631	5743	5858	5858	5858	5858	5858	5858	5858
Penetration Rate	*0%*	*1%*	*3%*	*5%*	*7%*	*9%*	*11%*	*12%*	*12%*	*12%*	*12%*	*12%*	*12%*	*12%*	*12%*
# Treated	0	51	156	265	379	497	619	689	703	703	703	703	703	703	703
KRN23 Cost/Yr	80000	81600	83232	84897	86595	88326	90093	91895	93733	93733	93733	93733	93733	93733	93733
Total ROW Peds Sales ('000)	$ -	$ 4,162	$ 12,989	$ 22,523	$ 32,806	$ 43,884	$ 55,803	$ 63,335	$ 65,894	$ 65,894	$ 65,894	$ 65,894	$ 65,894	$ 65,894	$ 65,894
ROW XLH Adult Build															
XLH ROW Adult Population	15000	15300	15606	15918	16236	16561	16892	17230	17575	17575	17575	17575	17575	17575	17575
Penetration Rate	*0%*	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*
# Treated	0	153	312	478	649	828	1014	1034	1054	1054	1054	1054	1054	1054	1054
KRN23 Cost/Yr	80000	81600	83232	84897	86595	88326	90093	91895	93733	93733	93733	93733	93733	93733	93733
Total ROW Adult Sales ('000)	$ -	$ 12,485	$ 25,978	$ 40,542	$ 56,240	$ 73,140	$ 91,313	$ 95,002	$ 98,841	$ 98,841	$ 98,841	$ 98,841	$ 98,841	$ 98,841	$ 98,841
Total KRN23 ROW Sales	**$ -**	**$ 16,646**	**$ 38,968**	**$ 63,065**	**$ 89,046**	**$ 117,023**	**$ 147,116**	**$ 158,337**	**$ 164,734**	**$ 164,734**	**$ 164,734**	**$ 164,734**	**$ 164,734**	**$ 164,734**	**$ 164,734**
Royalty to KHK (low single digit)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
ROW Revenue to Ultragenyx	**$ -**	**$ 16,147**	**$ 37,799**	**$ 61,173**	**$ 86,375**	**$ 113,513**	**$ 142,703**	**$ 153,587**	**$ 159,792**	**$ 159,792**	**$ 159,792**	**$ 159,792**	**$ 159,792**	**$ 159,792**	**$ 159,792**

Total KRN23 WW Sales	**$ 7,500**	**$ 183,110**	**$ 349,626**	**$ 524,792**	**$ 713,541**	**$ 904,494**	**$ 1,071,664**	**$ 1,190,170**	**$ 1,238,253**	**$ 1,238,253**	**$ 1,238,253**	**$ 1,238,253**	**$ 1,238,253**	**$ 1,238,253**	**$ 1,238,253**
Total KRN23 Revenue to Ultragenyx	**$ 3,750**	**$ 59,584**	**$ 119,306**	**$ 183,249**	**$ 252,106**	**$ 242,726**	**$ 305,697**	**$ 337,998**	**$ 351,653**	**$ 351,653**	**$ 351,653**	**$ 351,653**	**$ 351,653**	**$ 351,653**	**$ 351,653**

Source: Canaccord Genuity estimates

Intellectual property

KRN23 is protected by 20 issued patents, including three U.S. patents and one pending U.S. application and patents and applications in other jurisdictions covering generic and specific antibodies against FGF23 as well as their use for the treatment of XLH and related conditions. Issued US patents expire from 2022 to 2029, without extensions. KRN23 also has orphan drug designation both in the US and EU, conferring seven and 10 years marketing exclusivity if approved for XLH, respectively. There is no patent coverage for KRN23 in Latin America, where Ultragenyx has commercial rights.

Competitive landscape

With respect to KRN23, we are not aware of any other products currently in clinical development for the treatment of XLH.

Most XLH patients are managed with oral phosphate replacement and vitamin D therapy, which is not FDA approved for the disease. While cheap and widely available, this treatment is both highly inconvenient and carries significant risks. Therapy requires dosing up to 6x/day, is poorly tolerated due to G.I. upset, and necessitates careful medical monitoring due to the risk of nephrocalcinosis (phosphate-calcium precipitates in the kidneys due to excessive spikes in phosphate levels). Nephrocalcinosis can severely damage the kidneys and, if not caught early, can lead to permanent damage and chronic kidney disease (CKD). The risk of nephrocalcinosis often prompts physicians to prescribe sub optimal doses of phosphate and vitamin D. In addition, while partially effective at reducing rickets, these treatments do not meaningfully improve growth, which is the ultimate goal of treatment.

While nearly all pediatric XLH patients are treated with oral phosphate, treatment in the adult population is more variable due to the risk of nephrocalcinosis. As a result, exactly how much of the adult population would be addressable with KRN23 remains uncertain. While adults with more severe disease are more likely to be candidates for treatment with KRN23, how individual physicians will define disease severity remains unclear. The ongoing P2b adult study should help clarify what adult penetration rates will ultimately prove to be.

Partnership collaboration

In August 2013, Ultragenyx formed a collaboration with Kyowa Hakko Kirin Co, or KHK, to jointly develop and commercialize KRN23 for the treatment of XLH. It's a complicated deal that allowed Ultragenyx to secure rights to KRN23 without an upfront payment or milestone payments and still retain a significant portion of commercial upside to the program, while limiting exposure to KHK promotional costs. Ultragenyx brings to the collaboration drug development experience in the orphan space, while KHK brings experience with fully human mAbs and KRN23 in particular. The company's estimate from internal modeling is that Ultragenyx will receive about a third of the value of the product in these territories through all these various mechanisms.

Development collaboration

During clinical development, Ultragenyx leads development in the US, Canada, and Europe. Ultragenyx generates development expenses and KHK reimburses Ultragenyx for 50% of costs (50-50 development cost share). KHK provides KRN23 to Ultragenyx free of charge during development. After approval, Ultragenyx pays KHK for commercial supplies of KRN23. Ultragenyx is responsible for approval in US and Europe.

Commercial collaboration

In the US and Canada:

For the first five years of commercialization

- Ultragenyx will commercialize KRN23 and booked the costs
- KHK will book the sales revenue
- Profit share is 50%-50%
- During the profit share period, Ultragenyx pays KHK for commercial supplies of KRN23 (fixed percentage of net sales)

After the first five years of commercialization:

- KHK assumes the majority of commercial operations
- Ultragenyx will continue promoting to target audiences in the US and Canada
- Commercial expenses will be shared going forward
- Ultragenyx begins receiving a tiered revenue share in the mid- to high-20% range; this structure avoids KHK commercial expenses being charged to Ultragenyx
- For Ultragenyx, this arrangement approximates the 50-50 profit split from the first five years

In Europe:

- KHK retains rights to KRN23
- KHK commercializes KRN23
- KHK books sales
- Ultragenyx receives a tiered royalty up to 10% of sales

In Latin America:

- Ultragenyx leads launch and commercialization efforts
- Ultragenyx books sales
- Ultragenyx pays KHK a low single-digit royalty
- Ultragenyx pays KHK for commercial supplies of KRN23 (fixed percentage of net sales)

Manufacturing

KHK is the sole supplier of commercial quantities of KRN23. The supply price to Ultragenyx for commercial sales will be determined on a fixed double-digit percentage of net sales and will be higher than the typical cost of goods sold of companies focused on rare diseases. KHK will supply KRN23 for both clinical studies free of charge.

Triheptanoin (UX007) for Glut1 DS and LC-FAOD

Triheptanoin is oral, liquid, substrate replacement therapy in P2 development for glucose transporter type I deficiency syndrome (Glut1 DS) and long-chain fatty acid oxidation disorders (LC-FAOD).

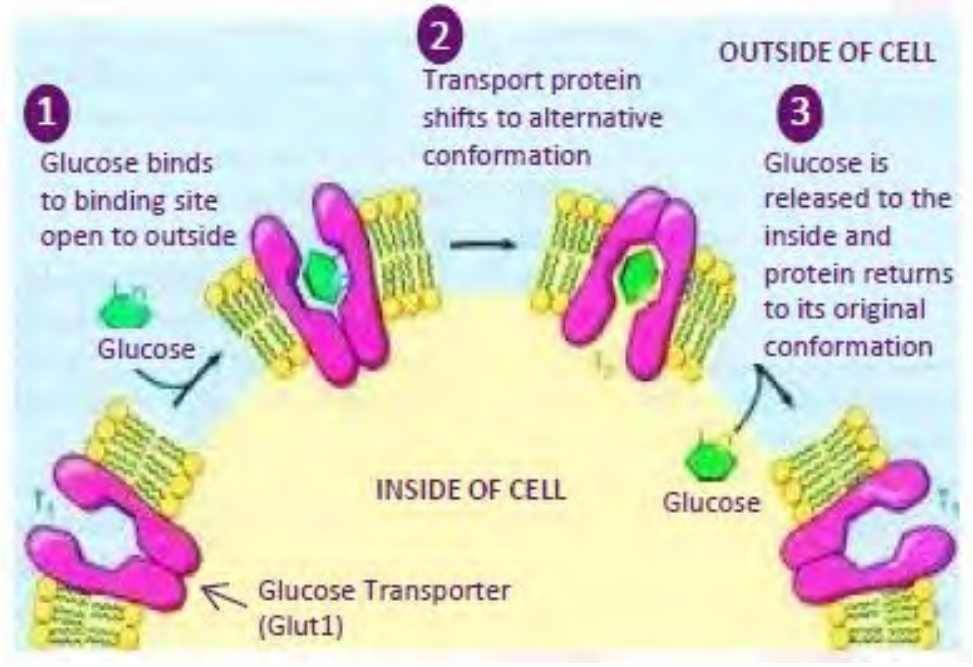
Triheptanoin (UX007) for Glut1 DS

Triheptanoin is in a Phase 2 study for the treatment of glucose transporter type-1 deficiency syndrome (Glut1 DS), a rare metabolic disease in which a glucose transport defect causes brain energy deficiency characterized by seizures, developmental delay, and movement disorder.

Glut1 DS background

Glut1 DS is an ultra-rare autosomal dominant disorder caused by a mutation in the SLC2A1 gene, which codes for the Glut1 protein. This protein functions as a glucose transporter, shuttling glucose from the blood, across the blood-brain barrier, and into the brain. Because glucose is the primary source of energy for the brain, patients with Glut1 DS have brains that are persistently and chronically starved for energy.

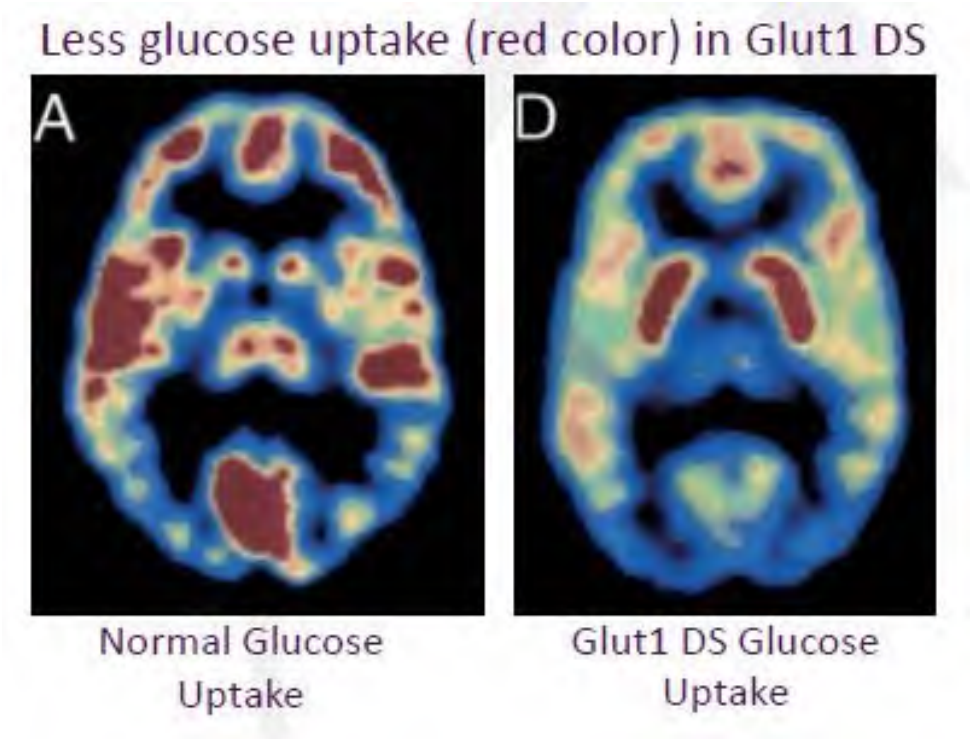
Figure 11: Normal glucose transport into the brain



Source: Company reports

Glut1 DS typically manifests in infants shortly after birth, as seizures usually set in between one and four months of age. The chronic glucose deficiency in the brain also causes developmental delay and movement disorders. Clinical suspicion of Glut1 DS often prompts testing of blood glucose levels in cerebrospinal fluid. The definitive diagnosis is typically made via genetic tests that are readily available.

Figure 12: Normal brain vs Glut1 DS on PET scan



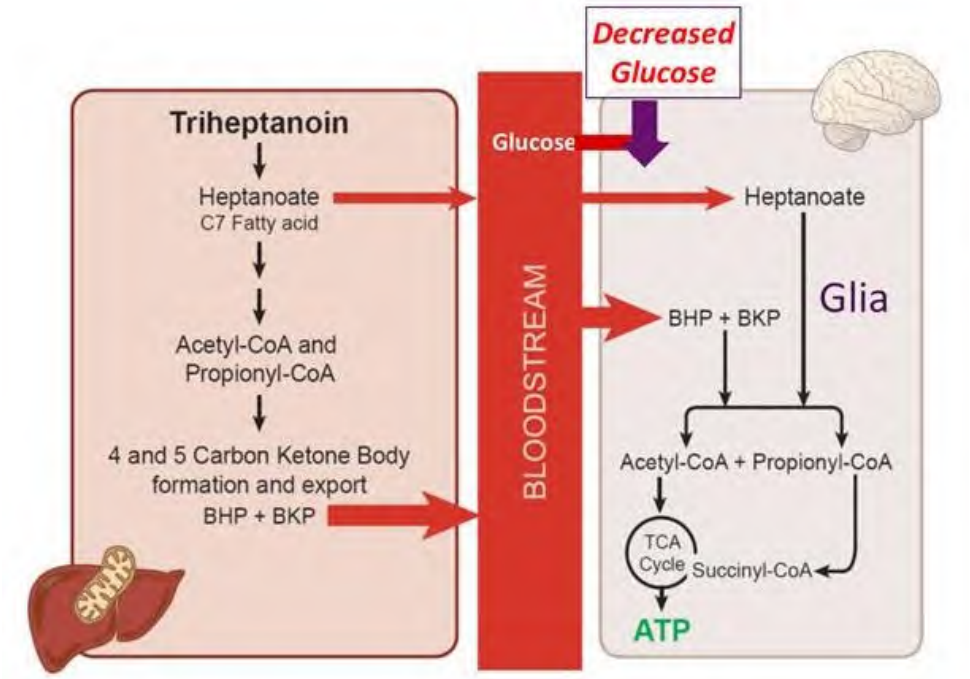
Source: Company reports

There are no approved drugs for Glut1 DS at present. The current SOC is the ketogenic diet in combination with one or more antiepileptic drugs. A ketogenic diet is an extreme high-fat/low-carbohydrate diet in which patients derive up to 90% of their daily calories from fat. This special diet is designed to force the liver to convert fat into fatty acids and ketone bodies. Ketone bodies can cross the blood-brain barrier and serve as an alternative fuel source to glucose. While ketogenic diets may help reduce seizure frequency, compliance presents a major challenge. In addition, these diets have marginal effects on developmental delay and movement disorders, and can cause kidney stones. There are no antiepileptic drugs (AEDs) approved specifically for patients with Glut 1 DS, and only ~10% of Glut1 DS patients achieve seizure control on these drugs alone.

Triheptanoin (UX007) for the treatment of Glut1 DS

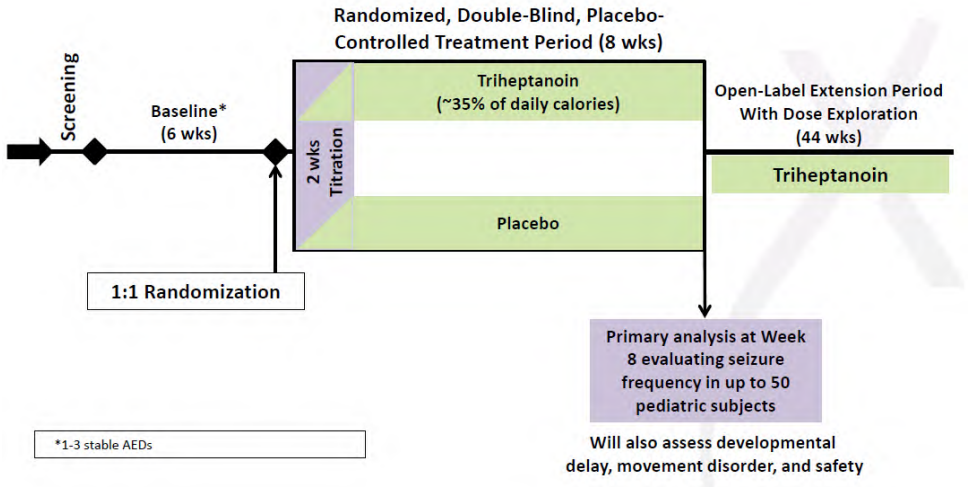
Triheptanoin is intended as a substrate replacement therapy intended to bypass defective glucose transport to provide an alternative energy source to the brain in Glut1 DS patients. The drug provides two kinds of ketone bodies, C4s and C5s, both of which cross the blood-brain barrier. It is also been shown to produce C7, which crosses the blood-brain barrier and has been shown to make glucose in the brain. Therefore, Triheptanoin produces multiple metabolites that can provide several energy sources to the brain, which may help treat the underlying cause of the disease. In addition, triheptanoin may also allow for reductions in the ketogenic diet, with less fat intake and increased tolerability and compliance.

Figure 13: Triheptanoin mechanism of action for Glut1 DS



Source: Company reports

Figure 14: Development status – P2 triheptanoin in Glut1 DS



Source: Company reports

In March 2014, Ultragenyx initiated a P2 global, randomized, double-blind, placebo-controlled, parallel-group, adaptive study to assess the safety and efficacy of triheptanoin in up to 50 Glut1 DS patients (1 to 35 yrs.) who are currently not fully compliant with ketogenic diet and continue to have an average of at least four seizures per month (including absence) despite current or prior use of AEDs. Enrolled subjects will maintain on their current SOC treatment with one to three AEDs throughout the study. After establishment of baseline seizure frequency over six

weeks, patients will be randomized to receive a triheptanoin dose of ~35% of their daily caloric intake (~1-4 g/kg/day depending on age) or placebo for an eight-week double-blind treatment period (two weeks titration, six weeks stable dose). The primary efficacy endpoint is the reduction in the frequency of generalized (including absence) and partial onset seizures compared to placebo between weeks two and eight of treatment. Safety will be assessed by AE rates, laboratory values, and ECG. The blinded treatment period will be followed by an open-label extension through week 52 for all enrolled patients. In addition, following the week 26 visit, ~ 40 subjects will participate in a 10-week dose exploration period to assess the impact of triheptanoin dose level on seizure control and other clinical manifestations such as movement disorders and cognitive deficits, and tolerability.

Clinical data

An independent clinical study recently published in the August 2014 edition of JAMA Neurology tested food grade triheptanoin in Glut1 DS patients. The study was an open-label cases series in 14 children and adults with Glut1 DS who were not receiving a ketogenic diet. Participants received open-label adjunctive supplementation with food-grade triheptanoin (1g/kg).

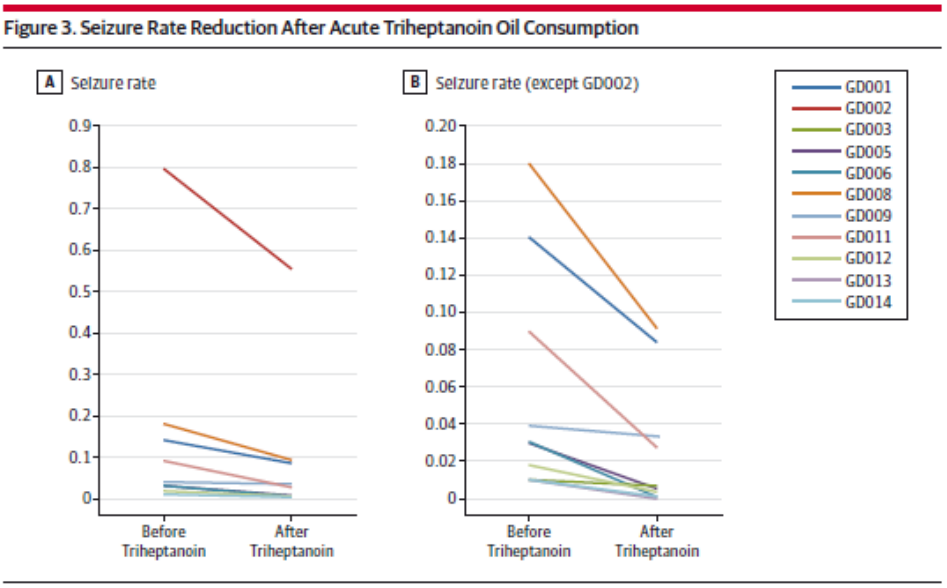
Safety

Triheptanoin was shown to be generally safe with no SAEs. One patient (7%) discontinued triheptanoin after three weeks due to gastric discomfort. Another patient experienced significant (10%) weight gain at two months after failing to follow the recommended study diet but remained on therapy throughout the trial. Two patients (14%) experienced diarrhea and GI discomfort shortly after initial treatment, but symptoms resolved after dose reduction and the dose was then gradually increased to target levels over several days.

Results

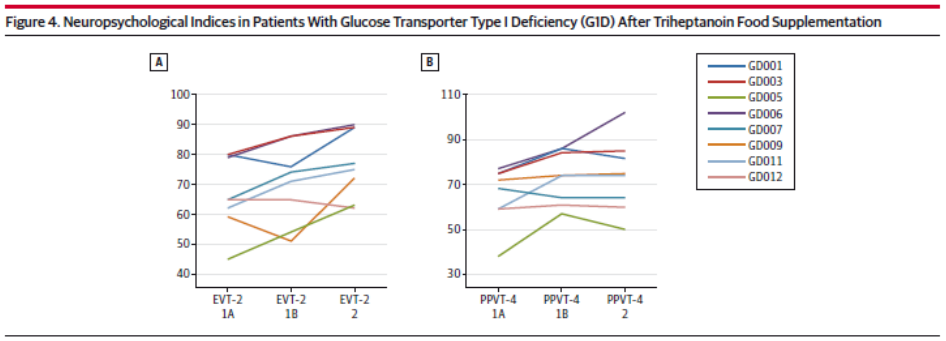
Results demonstrated that Glut1 DS patients who received triheptanoin experienced decreased rates of spikewave (absence) seizures, demonstrating POC for the drug's effect. In addition, several patients exhibited a rapid increase in the cerebral metabolic rate and improved neuropsychological performance. Based on these positive results, Ultragenyx recently modified the P2 enrollment criteria to include patients with absence seizures (vs. only tonic-clonic).

Figure 15: Seizure rate reduction after acute triheptanoin oil consumption



Source: Company reports

Figure 16: Neuropsychological indices in patients with glucose transporter type 1 deficiency (GID) after triheptanoin food supplementation



Source: Company reports

Competition

There are no approved drugs for Glut1 DS at present and we are not aware of competitive drugs and development. We believe the current SOC, a ketogenic diet and AEDs, will be used in combination with triheptanoin, if approved.

Market opportunity

Ultragenyx estimates prevalence to be between 3,000 and 7,000 patients in the US, based on a series of studies where patients with unidentified causes of seizures have been sequenced and found to have Glut1 deficiency. In the developed world, prevalence is estimated at 12,000 to 20,000 patients, with an incidence of 1:90,000. Since Glu1 DS is inherited, the identification of one affected family member may lead to the discovery of other affected relatives.

Figure 17: Revenue model

Trihep GLUT1 DS Revenue Model

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
US Trihep GLUT1 DS Revenue Build															
# of GLUT1 DS Pts	3300	3301	3302	3303	3304	3305	3306	3307	3308	3309	3310	3311	3312	3313	3314
Penetration Rate	*3%*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*65%*	*70%*	*70%*	*70%*	*70%*	*70%*	*70%*	*70%*
# Treated	99	330	660	991	1322	1653	1984	2150	2316	2316	2317	2318	2318	2319	2320
Trihep Cost/Yr	75000	76500	78030	79591	81182	82806	84462	86151	87874	87874	87874	87874	87874	87874	87874
Total US Trihep GLUT1 DS Sales ('000)	$ 7,425	$ 25,253	$ 51,531	$ 78,866	$ 107,291	$ 136,837	$ 167,539	$ 185,187	$ 203,482	$ 203,544	$ 203,605	$ 203,667	$ 203,728	$ 203,790	$ 203,851
Total US Trihep GLUT1 DS Sales ('000)	**$ 7,425**	**$ 25,253**	**$ 51,531**	**$ 78,866**	**$ 107,291**	**$ 136,837**	**$ 167,539**	**$ 185,187**	**$ 203,482**	**$ 203,544**	**$ 203,605**	**$ 203,667**	**$ 203,728**	**$ 203,790**	**$ 203,851**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
EU Trihep GLUT1 DS Revenue Build															
# of GLUT1 DS Pts	4200	4201	4202	4203	4204	4205	4206	4207	4208	4209	4210	4211	4212	4213	4214
Penetration Rate	*2%*	*7%*	*13%*	*20%*	*27%*	*33%*	*40%*	*43%*	*47%*	*51%*	*55%*	*59%*	*63%*	*67%*	*70%*
# Treated	84	280	560	841	1121	1402	1682	1823	1964	2147	2316	2484	2654	2823	2950
Trihep Cost/Yr	65000	66300	67626	68979	70358	71765	73201	74665	76158	76158	76158	76158	76158	76158	76158
Total EU Trihep GLUT1 DS Sales ('000)	$ 5,460	$ 18,568	$ 37,889	$ 57,983	$ 78,876	$ 100,591	$ 123,153	$ 136,116	$ 149,554	$ 163,480	$ 176,344	$ 189,213	$ 202,089	$ 214,972	$ 224,650
Total EU Trihep GLUT1 DS Sales ('000)	**$ 5,460**	**$ 18,568**	**$ 37,889**	**$ 57,983**	**$ 78,876**	**$ 100,591**	**$ 123,153**	**$ 136,116**	**$ 149,554**	**$ 163,480**	**$ 176,344**	**$ 189,213**	**$ 202,089**	**$ 214,972**	**$ 224,650**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ROW Trihep GLUT1 DS Revenue Build															
# of LCFA-OD Pts	6000	6001	6002	6003	6004	6005	6006	6007	6008	6009	6010	6011	6012	6013	6014
Penetration Rate	*2%*	*7%*	*13%*	*20%*	*27%*	*33%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*
# Treated	120	400	800	1201	1601	2002	2402	2403	2403	2404	2404	2404	2405	2405	2406
Trihep Cost/Yr	65000	66300	67626	68979	70358	71765	73201	74665	76158	76158	76158	76158	76158	76158	76158
Total ROW Trihep GLUT1 DS Sales ('000)	$ 7,800	$ 26,524	$ 54,119	$ 82,816	$ 112,648	$ 143,650	$ 175,857	$ 179,404	$ 183,023	$ 183,053	$ 183,083	$ 183,114	$ 183,144	$ 183,175	$ 183,205
Total ROW Trihep GLUT1 DS Sales ('000)	**$ 7,800**	**$ 26,524**	**$ 54,119**	**$ 82,816**	**$ 112,648**	**$ 143,650**	**$ 175,857**	**$ 179,404**	**$ 183,023**	**$ 183,053**	**$ 183,083**	**$ 183,114**	**$ 183,144**	**$ 183,175**	**$ 183,205**
Total Trihep GLUT1 DS WW Sales ('000)	**$ 20,685**	**$ 70,345**	**$ 143,538**	**$ 219,665**	**$ 298,815**	**$ 381,078**	**$ 466,549**	**$ 500,707**	**$ 536,058**	**$ 550,076**	**$ 563,032**	**$ 575,994**	**$ 588,962**	**$ 601,936**	**$ 611,707**
Royalty to Baylor Research Institute	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Total Trihep GLUT1 DS Net Sales to Ultragenyx ('000)	**$ 19,651**	**$ 66,828**	**$ 136,362**	**$ 208,682**	**$ 283,874**	**$ 362,024**	**$ 443,221**	**$ 475,671**	**$ 509,255**	**$ 522,573**	**$ 534,881**	**$ 547,194**	**$ 559,514**	**$ 571,839**	**$ 581,122**

Source: Canaccord Genuity estimates

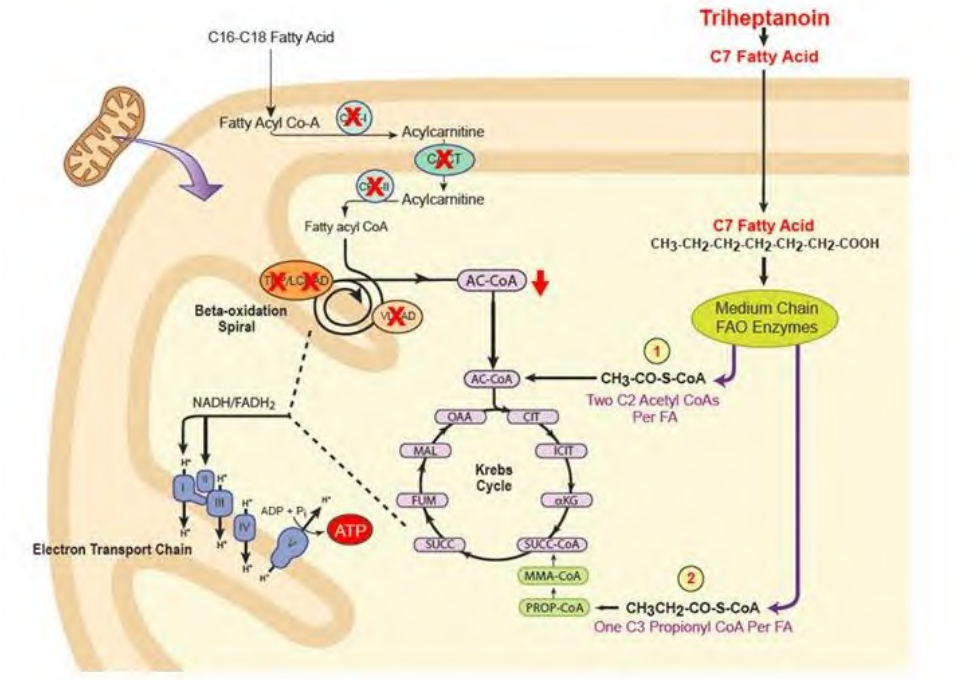
Triheptanoin (UX007) for LC-FAOD

Patients with LC-FAOD have a mitochondrial enzyme deficiency that results in an inability to use long chain fatty acids as an energy source. Ultragenyx is developing triheptanoin as a substrate replacement therapy for these patients. Triheptanoin is an oral, liquid, synthetic triglyceride (oil) that serves as an alternative energy source to long-chain fatty acids. The drug's specifically designed chemical composition (three 7-carbon fatty acids) provides medium-length odd-chain fatty acids, which, unlike long-chain fatty acids, can be metabolized by LC-FAOD patients to produce energy. In addition, because triheptanoin contains an odd-chain fatty acid (vs MCT even-chain), it also replaces some of the Krebs cycle intermediates that are deficient in these patients, further enhancing cellular energy production.

Disease presentation in these patients is variable and episodic. Patients often look and feel normal. However, exercise, fasting, or illness can precipitate critical energy shortages that may result in hypoglycemia, acute muscle rupture, heart failure, or even death. Reported mortality for LC-FAOD approaches 50% over a 10-year period. LC-FAOD is also known to be a cause of SIDS, and newborns are routinely screened for the disease in all 50 US states and in multiple countries in Europe. The estimated prevalence is ~2,000 to 3,000 patients in the US and approximately 65-100 new patients WW are identified each year through newborn screening.

No drugs or treatments are currently approved for LC-FAOD. Current standard of care (SOC) includes diligent avoidance of fasting, a special low-fat/high-carbohydrate diet, and carnitine supplementation in some cases. Diet supplementation with medium-chain triglyceride (MCT) oil, a medical food product, is also recommended. Despite treatment with the current SOC, many patients continue to suffer significant morbidity and mortality from LC-FAOD.

Figure 18: Triheptanoin mechanism of action



Source: Company reports

LC-FAOD disease background

Glucose is the primary source of energy in the body. When glucose levels are low, fatty acids stored in adipose tissue serve as the body's major fuel storage reserve. When the body needs fuel, these fatty acids are completely oxidized within the mitochondria of cells to yield abundant energy (9kcal/gm of fat vs just 4kcal/gm of protein or carbohydrate). Once mobilized from fat, free fatty acids are bound to albumin and transported to the tissues. Here, they enter cells, are activated to their CoA derivatives, and are oxidized in the mitochondria for energy. This catabolic pathway is called β-oxidation.

Once inside the cytosol of cells, fatty acids are combined with coenzymeA (CoA) to form fatty acyl-CoA and then transported across the outer mitochondrial membrane. However, in order for β-oxidation to take place, the fatty acyl-CoA must first cross the inner mitochondrial membrane. Because the inner mitochondrial membrane is impermeable to CoA, the CoA must first be removed from the fatty acid by an enzyme called CPT-I. Once the CoA is removed, the fatty acid can then cross the inner mitochondrial membrane and enter the inner mitochondrial matrix. Once inside the inner mitochondrial matrix, an enzyme called CPT-II re-attaches CoA to the fatty acid (once again yielding fatty acyl-CoA). The net result is that the fatty acid has now been transported inside the mitochondrial matrix and is in a form (fatty acyl-CoA) in which it can be metabolized for energy.

LC-FAOD - the disease

LC-FAOD is a diverse group of rare genetically inherited (autosomal recessive) metabolic disorders in which the body is unable to break down fatty acids to produce energy. This can lead to depletion of glucose in the body and severe damage to the liver, muscles, and heart. Severe energy crises in LC-FAOD patients can result in significant morbidity and even death.

LC-FAOD is caused by genetic mutations that result in deficient mitochondrial enzymes (i.e. CPT-I or CPT-II, or others) that are involved in the breakdown of LCFAs. These patients either cannot import LCFAs into the mitochondrial matrix, or cannot oxidize them into shorter pieces that can be utilized for energy by the Krebs cycle. In addition to the metabolic defect, the buildup of long-chain fatty acids can cause damage to the mitochondria and Krebs cycle dysfunction.

Triheptanoin clinical data for LC-FAOD

Triheptanoin has been studied clinically for over 13 years in ~130 patients, including >60 with LC-FAOD. Several investigator-sponsored open-label studies point to clinical improvements with triheptanoin treatment, even when used on top of SOC.

Reports from the literature suggest that triheptanoin is generally safe and well tolerated in LC-FAOD patients. Reported non-serious TEAEs include primarily GI side effects (cramping, diarrhea, and loose stools), which can usually be managed by dose titration upon starting therapy. In clinical studies, SAEs classified as possibly related to triheptanoin include two cases of muscle cell rupture and elevated CK, and one case of myoglobinuria. It should be noted, however, that these SAEs are also considered typical of the underlying disease, so the direct connection to triheptanoin remains unclear in these cases.

Ultragenyx has also conducted a GCP-compliant, retrospective, protocol-driven, medical chart review that assessed the clinical outcome of 20 LC-FAOD subjects who received triheptanoin on a compassionate use basis. The data showed that treatment with triheptanoin reduced the frequency and severity of hospitalizations for disease-related causes. Impressively, mean total hospital days per year were reduced from 17.55 to 5.40 (69%; p = 0.0242). Hospital days for hypoglycemia were also reduced by a statistically significant 98%, and a statistically significant decrease in mean

hypoglycemic events per year was also observed. Other notable findings included a 64% reduction in hospital days for rhabdomyolysis, as well as a 68% reduction in mean peak CK levels. We view these data as highly supportive of triheptanoin as a potential treatment for LC-FAOD.

Figure 19: Retrospective study data of 20 compassionate use patients

Retrospective study data of 20 compassionate use patients

Description	Pre-treatment	Post-treatment	% Decrease	n	p value
Mean total hospital days/year[1,2]	17.55	5.40	69%	15	**0.0242**
Mean total hospitalizations/year[1]	1.94	1.26	36%	16	0.1126
Mean infant total hospitalizations/year[3]	13.01	1.37	89%	4	0.0892
Mean hypoglycemia total hospital days/year[1,2,4]	8.42	0.18	98%	9	**0.0257**
Mean hypoglycemia events/year[1,4]	0.92	0.04	96%	9	**0.0091**
Mean rhabdomyolysis total hospital days/year[1,5]	5.94	2.16	64%	9	0.1224
Mean rhabdomyolysis events/year[1,5]	1.05	0.68	35%	11	0.4604
Mean peak creatine kinase (units) for rhabdomyolysis events[1,5]	85,855	25,797	68%	7	0.1279

[1] Excludes data for 4 infants dosed within first 6 months of life.
[2] Excludes hospitalizations with unknown discharge dates.
[3] Four infants were dosed within the first 6 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.

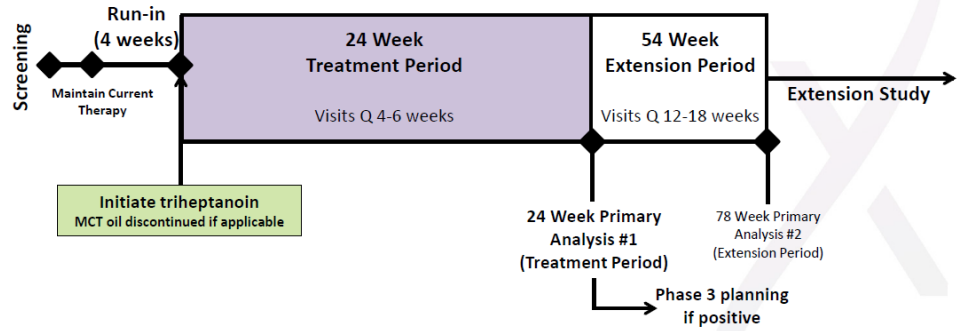
- Data presented at ICIEM September 2013
- 20 patients treated for up to 13 years
- 319 hospitalizations, 120 charts, 241 years

Source: Company reports

Triheptanoin development status for LC-FAOD

In February 2014, Ultragenyx initiated a P2 study of triheptanoin in six different subtypes of patients with LC-FAOD. The trial is a multinational (US and EU), prospective, interventional, open-label P2 study in ~30 severely affected LC-FAOD patients, ages six months to 35 years, exhibiting significant clinical manifestations of LC-FAOD despite current therapy.

Figure 20: Triheptanoin LC-FAOD P2 trial design



- N = ~30 severe subjects, first patient enrolled in February 2014
- Dosed at 25-35% of daily caloric intake
- Evaluate exercise tolerance (cycle erg, 12MWT, muscle strength, event rate, CK, etc.), hypoglycemia, liver size, cardiac disease
- Interim data expected in 2015

Source: Company reports

A primary goal is to identify the appropriate patient population and clinical endpoints for pivotal studies. Following a four-week run-in period on current therapy to establish baseline condition, subjects will cross over to 24 weeks of daily oral triheptanoin, titrated to a target dose of 25-35% of total daily caloric intake. Following the 24 weeks of treatment, patients will be treated for an additional 54 week extension period. Trial results are expected in 2H15.

The impact of triheptanoin will be assessed by evaluating the change from baseline over 24 weeks of treatment across three relevant disease areas:

1) **Skeletal myopathy:** exercise intolerance measured by cycle ergometry, muscle weakness and fatigue, muscle function measured by 12MWT, motor development measured by the PDMS-2, functional disability, the number and duration of major rhabdomyolysis events, and non-CK levels;
2) **Hepatic disease:** number of symptomatic or clinically important hypoglycemia events treated at home, number and duration of major hypoglycemia events, fasting serum glucose levels, liver size by hepatic ultrasound; and
3) **Cardiac disease:** cardiac medication required for maintenance treatment, number and duration of major cardiomyopathy events, cardiomyopathy and cardiac function as measured by ECHO and ECG, and non-acute levels of BNP and troponin.

Triheptanoin competition in LC-FAOD

There are currently no approved drugs or treatments specifically for LC-FAOD. Triheptanoin is currently available in food-grade form. Although Ultragenyx believes that triheptanoin should be considered a drug and will be regulated that way, it is possible that other companies could attempt to produce triheptanoin for use by LC-FAOD, Glut1 DS, and other patients by attempting to sell the product via a nutraceutical or food pathway. That said, Ultragenyx continues to develop its pharmaceutical grade triheptanoin in accordance with proper drug development. The company has performed all requisite toxicology studies and manufactures the drug under cGMP practices.

To protect the triheptanoin asset, Ultragenyx and partner BRI have been building out the IP position and seeking orphan drug status for appropriate disease indications.

B. Braun Medical has received orphan drug designation for triheptanoin in Europe for certain LC-FAOD indications. However, B. Braun chose not to exercise its EU licensing option for triheptanoin from Baylor. Baylor subsequently licensed EU rights to Ultragenyx (see IP below).

Figure 21: Revenue model

Trihep LC-FAOD Revenue Model

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
US Trihep LC-FAOD Revenue Build															
# of LC-FAOD Pts	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764
Penetration Rate	*3%*	*8%*	*12%*	*16%*	*20%*	*24%*	*28%*	*32%*	*35%*	*38%*	*41%*	*44%*	*45%*	*48%*	*50%*
# Treated	83	220	330	440	551	661	772	882	965	1048	1132	1215	1243	1326	1382
Trihep Cost/Yr	75000	76500	78030	79591	81182	82806	84462	86151	87874	87874	87874	87874	87874	87874	87874
Total US Trihep LC-FAOD Sales ('000)	$ 6,188	$ 16,836	$ 25,769	$ 35,058	$ 44,715	$ 54,751	$ 65,178	$ 76,006	$ 84,825	$ 92,129	$ 99,439	$ 106,753	$ 109,219	$ 116,543	$ 121,442
Total US Trihep LC-FAOD Sales ('000)	**$ 6,188**	**$ 16,836**	**$ 25,769**	**$ 35,058**	**$ 44,715**	**$ 54,751**	**$ 65,178**	**$ 76,006**	**$ 84,825**	**$ 92,129**	**$ 99,439**	**$ 106,753**	**$ 109,219**	**$ 116,543**	**$ 121,442**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
EU Trihep LC-FAOD Revenue Build															
# of LC-FAOD Pts	4583	4584	4585	4586	4587	4588	4589	4590	4591	4592	4593	4594	4595	4596	4597
Penetration Rate	*2%*	*5%*	*8%*	*11%*	*13%*	*16%*	*19%*	*21%*	*23%*	*25%*	*27%*	*29%*	*30%*	*32%*	*33%*
# Treated	92	244	367	489	612	734	857	979	1071	1163	1256	1348	1379	1471	1532
Trihep Cost/Yr	65000	66300	67626	68979	70358	71765	73201	74665	76158	76158	76158	76158	76158	76158	76158
Total EU Trihep LC-FAOD Sales ('000)	$ 5,958	$ 16,210	$ 24,807	$ 33,745	$ 43,034	$ 52,685	$ 62,709	$ 73,117	$ 81,589	$ 88,601	$ 95,617	$ 102,636	$ 104,991	$ 112,015	$ 116,708
Total EU Trihep LC-FAOD Sales ('000)	**$ 5,958**	**$ 16,210**	**$ 24,807**	**$ 33,745**	**$ 43,034**	**$ 52,685**	**$ 62,709**	**$ 73,117**	**$ 81,589**	**$ 88,601**	**$ 95,617**	**$ 102,636**	**$ 104,991**	**$ 112,015**	**$ 116,708**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ROW Trihep LC-FAOD Revenue Build															
# of LC-FAOD Pts	6000	6001	6002	6003	6004	6005	6006	6007	6008	6009	6010	6011	6012	6013	6014
Penetration Rate	*1%*	*3%*	*4%*	*5%*	*7%*	*8%*	*9%*	*11%*	*12%*	*13%*	*14%*	*15%*	*15%*	*16%*	*17%*
# Treated	60	160	240	320	400	480	561	641	701	761	821	882	902	962	1002
Trihep Cost/Yr	65000	66300	67626	68979	70358	71765	73201	74665	76158	76158	76158	76158	76158	76158	76158
Total ROW Trihep LC-FAOD Sales ('000)	$ 3,900	$ 10,610	$ 16,236	$ 22,084	$ 28,162	$ 34,476	$ 41,033	$ 47,841	$ 53,382	$ 57,967	$ 62,554	$ 67,142	$ 68,679	$ 73,270	$ 76,336
Total ROW Trihep LC-FAOD Sales ('000)	**$ 3,900**	**$ 10,610**	**$ 16,236**	**$ 22,084**	**$ 28,162**	**$ 34,476**	**$ 41,033**	**$ 47,841**	**$ 53,382**	**$ 57,967**	**$ 62,554**	**$ 67,142**	**$ 68,679**	**$ 73,270**	**$ 76,336**
Total Trihep LC-FAOD WW Sales ('000)	**$ 16,046**	**$ 43,656**	**$ 66,811**	**$ 90,887**	**$ 115,911**	**$ 141,913**	**$ 168,920**	**$ 196,964**	**$ 219,796**	**$ 238,698**	**$ 257,609**	**$ 276,531**	**$ 282,890**	**$ 301,828**	**$ 314,486**
Royalty to Baylor Research Institute	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Total Trihep LC-FAOD Net Sales to Ultragenyx	**$ 15,244**	**$ 41,473**	**$ 63,471**	**$ 86,343**	**$ 110,116**	**$ 134,817**	**$ 160,474**	**$ 187,116**	**$ 208,806**	**$ 226,763**	**$ 244,729**	**$ 262,704**	**$ 268,745**	**$ 286,736**	**$ 298,761**

Source: Canaccord Genuity estimates

Intellectual property - triheptanoin

In 2012, Ultragenyx obtained an exclusive license from Baylor Research Institute (BRI) with respect to its triheptanoin patent portfolio. In exchange, Ultragenyx agreed to pay BRI a mid-single-digit royalty on future net sales, development milestone payments of up to $10.5M, and up to an additional $7.5M based on sales thresholds.

The BRI license includes 24 issued patents (U.S. seven issued and eight pending) as well as patents and applications in ex-U.S. jurisdictions. These cover composition, formulation, use and manufacturing of triheptanoin and related odd carbon fatty acids. The issued U.S. patent terms are from 2020 to 2024 (without extensions). The projected patent terms for U.S. pending applications are from 2020 to 2034.

Beyond the IP portfolio, Ultragenyx has been granted US orphan drug designation for triheptanoin for the treatment of Glut1 DS.

In August 2014, Ultragenyx announced a license agreement with UniQuest Pty Limited for IP related to the treatment of refractory epilepsy and other seizure-related and neurologic disorders with triheptanoin.

Separately, the company announced the issuance of a U.S. patent with claims directed to compositions of triheptanoin above a certain level of purity. The patent term expires in October 2025 (without potential extension). Similar claims are either granted or being pursued by Ultragenyx in other territories outside the U.S.

Triheptanoin competitive landscape in LC-FAOD

There are currently no approved drugs or treatments specifically for LC-FAOD. The current standard of care for LC-FAOD includes diligent prevention of fasting combined with the use of low-fat/high-carbohydrate diets, carnitine supplementation in some cases, and MCT oil. Despite treatment with the current SOC, many patients continue to suffer significant morbidity and mortality.

Food grade (nutraceutical) triheptanoin is available and currently being studied in investigator sponsored trials for multiple indications. While not widely available and unlikely to be used for LC-FAOD or Glut1 DS if triheptanoin is approved as a drug for those indications, food grade triheptanoin could conceivably pose a competitive threat. It is possible that nutraceutical companies could attempt to produce triheptanoin for use by LC-FAOD and Glut1 DS patients by selling it as a food product.

Triheptanoin manufacturing

The pharmaceutical-grade drug substance for triheptanoin is manufactured by Cremer Oleo GmbH & Co. KG in Germany under an exclusive worldwide supply agreement executed in 2012. The supply agreement has an initial term of three years and is automatically renewed for bi-annual terms beginning in 2015 unless either party opts out. Triheptanoin drug product manufacturing has been done with more than one party and is not considered a very specialized task.

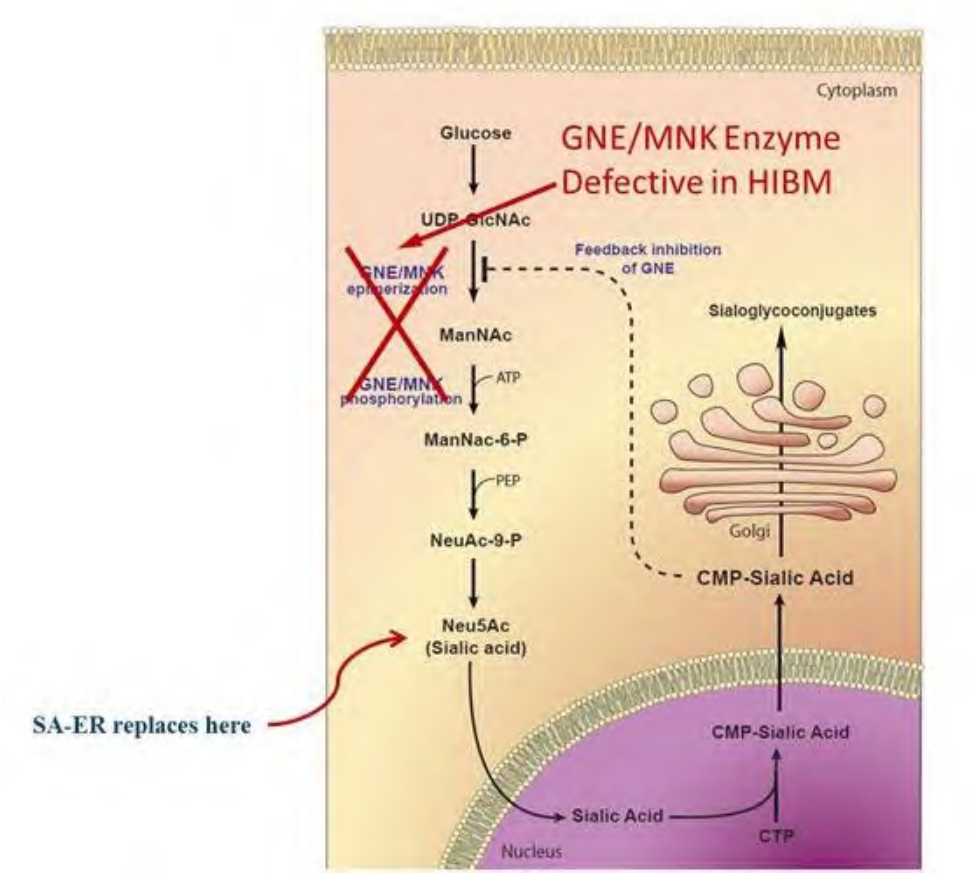
SA-ER (UX001) for the treatment of HIBM

SA-ER (UX001) is an extended-release, oral formulation of sialic acid (small molecule) in P2 development for the treatment of hereditary inclusion body myopathy (HIBM; a.k.a. GNE myopathy). HIBM is caused by a defect in the gene that codes for an enzyme involved in the first step in sialic acid biosynthesis. Sialic acid is required for the sialylation of lipids and proteins in muscle cells, which allows for normal muscle growth and repair. In HIBM patients, chronic sialic acid deficiency interferes with muscle function, leading to myopathy and atrophy. There are an estimated 1,200 to 2,000 HIBM patients in the developed world.

There are currently no approved treatments for HIBM. Immediate-released sialic acid is widely available in health food stores, but its treatment effect is limited by short half-life and rapid metabolism in the body (within one to two hours).

Ultragenyx is developing SA-ER as an extended-release sialic acid replacement therapy for HIBM. SA-ER is designed to address the sialic acid deficiency in HIBM patients and restore muscle function. The drug's extended-release formulation provides high levels of sialic acid coverage over a 24-hour period. SA-ER has received orphan drug designation in both the US and EU. The company has reported positive Phase 2 and extension results and aims to launch a P3 study in 1H15.

Figure 22: SA-ER mechanism of action



Source: Company reports

Disease background

HIBM is a heterogeneous group of genetic disorders, characterized by severe, slowly progressive, adult-onset muscle disease. HIBM is caused by a defect in the gene that codes for an enzyme involved in the first step in sialic acid biosynthesis. The resulting sialic acid deficiency interferes with muscle function, leading to myopathy and atrophy.

First symptoms (muscle weakness) typically appear in the late teens or twenties. Affected patients may first notice subtle changes, such as: difficulty walking on their heels; difficulty running; a weak index finger; or frequent loss of balance. The degree of muscle weakness and rate of disease progression varies widely among patients. For most patients, progressively increasing weakness over a 10 - 15 year period leaves them wheelchair-bound.

HIBM can be inherited as either autosomal dominant (IBM1) or autosomal recessive (IBM2 - primarily affects Persian Jews - spares quadriceps) traits. Phenotypic expression is variable, but the underlying muscle pathology shows structural similarities. Typical findings on muscle biopsy include inclusion bodies, rimmed vacuoles, and amyloid buildup. The exact pathophysiological disease mechanism is not well understood.

Clinical suspicion of HIBM is based on symptoms and muscle weakness pattern. Diagnostic confirmation is made on muscle biopsy and genetic testing.

There is no cure or approved therapy for HIMB and current treatments are mainly palliative. Orthotics (i.e. AFOs), canes and wheelchairs are used to provide stability and enhance mobility.

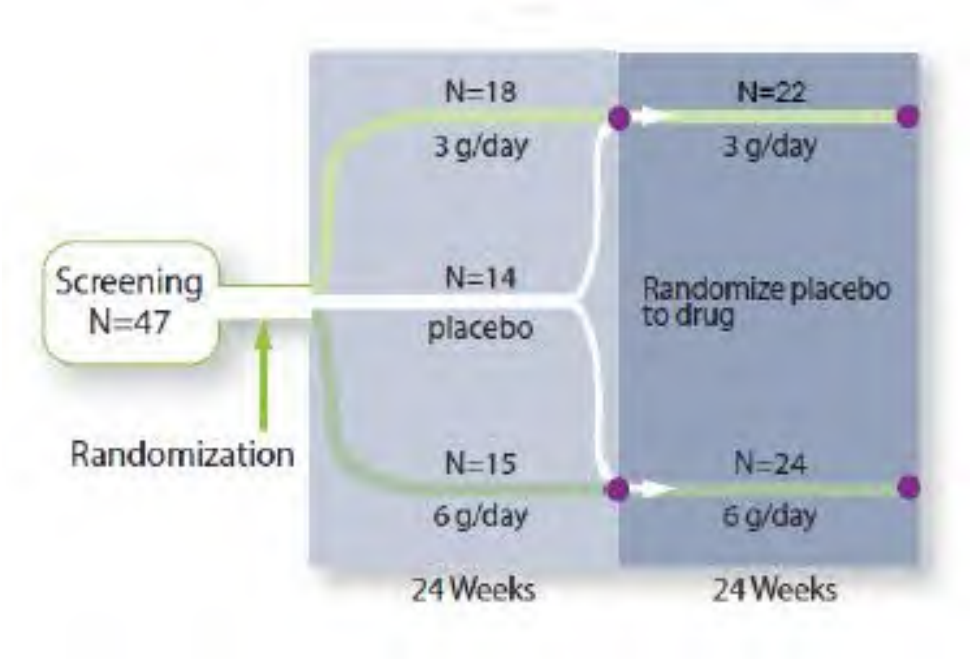
SA-ER P2 results

Ultragenyx conducted a P2, randomized, double-blind, placebo-controlled, parallel-group study of SA-ER in 47 HIBM patients. Initial topline results were released in December 2013, and full results were presented at the Emerging Sciences Session of the AAN in April 2014. Following these results, interim data from the P2 extension study were presented at the World Muscle Society meeting in October 2014.

P2 trial design

In the P2 study, patients were initially randomized to receive placebo, 3g, or 6g of SA-ER per day. After 24 weeks, placebo patients crossed over to receive a daily dose of either 3g or 6g, on a blinded basis, for an additional 24 weeks. Results compared change from baseline at week 48 for the combined groups at 6g/day vs 3g/day. Assessments included pharmacokinetics, composites of upper extremity (UE) and lower extremity (LE) muscle strength as measured by dynamometry, other clinical endpoints, patient reported outcomes, and safety.

Figure 23: SA-ER P2 trial design



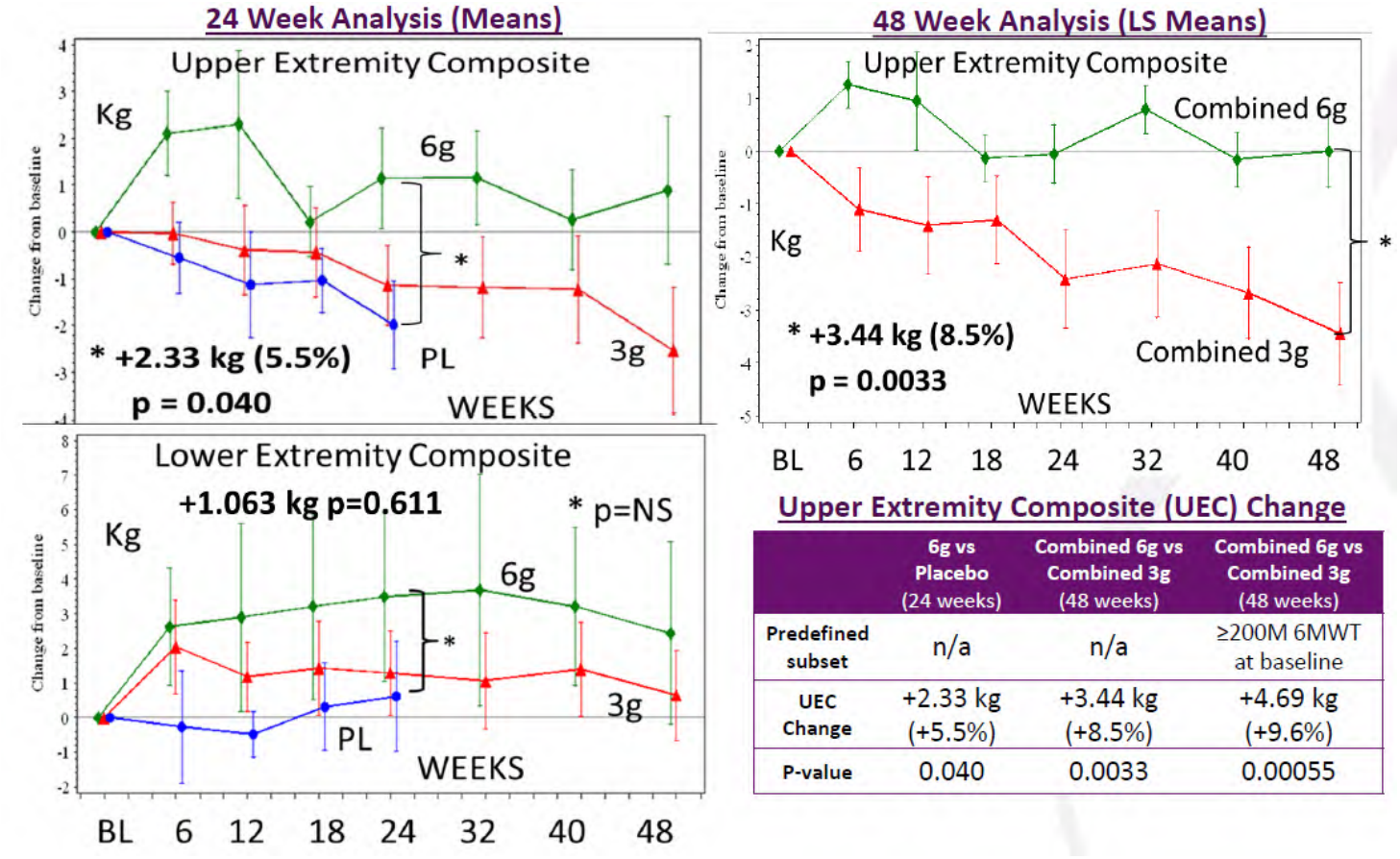
Source: Company reports

SA-ER P2 trial results

SA-ER was well tolerated with no SAEs observed in either dose group. No dose-dependent TEAEs were identified. Most AEs were mild to moderate and most commonly GI in nature.

At 24 weeks, a statistically significant difference in the 6g group vs placebo (+2.33 kg; 5.5% relative difference from baseline; p=0.040) was observed in the UE composite of muscle strength. At 48 weeks, a statistically significant difference between the combined 6g group and the combined 3g group was observed (+3.44 kg; 8.5% relative difference from baseline; p=0.0033). Patients with less advanced disease (walk >200 meters at baseline; ~70% of total enrollment) showed a more pronounced difference (+4.69 kg; 9.7% relative difference from baseline; p=0.00055). The LE composite showed a similar positive trend that did not reach statistical significance between the dose groups. This lack of effect could possibly be due to patients having only 20% to 25% of normal LE strength at baseline (vs 50% to 55% for UE), which may have made additional declines in LE strength difficult to detect. All groups showed stabilization during the treatment period and none showed significant decline. No significant difference was observed in 6MWT.

Figure 24: SA-ER P2 trial results



Upper Extremity Composite (UEC) Change

	6g vs Placebo (24 weeks)	Combined 6g vs Combined 3g (48 weeks)	Combined 6g vs Combined 3g (48 weeks)
Predefined subset	n/a	n/a	≥200M 6MWT at baseline
UEC Change	+2.33 kg (+5.5%)	+3.44 kg (+8.5%)	+4.69 kg (+9.6%)
P-value	0.040	0.0033	0.00055

Source: Company reports

The GNE Myopathy Functional Activity Scale (GNEM-FAS; a functional patient reported outcome measure) did not show differences at 24 weeks but showed a positive trend at 48 weeks in total (p=0.086), mobility (p=0.087), and UE scores (p=0.096) in the combined 6g versus the combined 3g groups. A post-hoc statistical analysis showed statistical significance in these GNEM-FAS outcomes.

Patients from this study continued in an extension study evaluating a 12g daily dose.

SA-ER interim P2 extension study results

In October 2014, Ultragenyx announced interim data from the P2 extension study of SA ER at the International Congress of the World Muscle Society.

In the first part of the extension study, all 46 patients from the 48-week P2 study crossed over to 6g/day for a variable period (avg. 24 wks). In the second part, all 46 patients and 13 treatment-naïve patients received 12g/day for 24 weeks. The results presented at WMS included the 49 out of 59 patients who had 24 weeks of data at the higher dose.

The 12g/day dose did not show any clinically meaningful advantage over 6g/day but was safe and well tolerated with no drug-related SAE. Mild to moderate GI AEs were observed (12g/day>6g/day). Over the two-year study, treatment with SA-ER appeared to slow the progression of UE disease compared to the 24-week placebo group extrapolated out to two years.

Development status

Based on the P2 data, Ultragenyx held an end of P2 meeting with the FDA in which the agency accepted a pivotal study design. The FDA agreed with an upper extremity composite of muscle strength as a primary endpoint. Supportive secondary endpoint data will be derived from the patient reported functional activity scale. The trial will enroll ~80 for a one-year treatment period. Ultragenyx expects to finalize discussions with the EMA in 4Q15 and expects to launch a P3 study in mid-15. We would expect the P3 data to mature in the 1H17 timeframe.

Competitive landscape

There are currently no approved treatments for HIBM. Immediate-released sialic acid is widely available in health food stores, but its treatment effect is limited by short half-life and rapid metabolism in the body (within 1 to 2 hours).

A program at the National Institutes of Health is investigating the use of a separate metabolite in the sialic acid pathway, N-acetyl mannosamine (ManNAc) for the treatment of HIBM. Unlike sialic acid, ManNAc is not a charged molecule, which might improve its relative distribution and uptake, a potential advantage. The program is licensed to New Zealand Pharma, which manufactures ManNAc. A NIH-sponsored P1 study was completed in 2013. While a P2 has yet to begin, Ultragenyx anticipates that ManNAc will advance into P2 testing.

Partnership collaborations

Nobelpharma

In September 2010, Ultragenyx entered into a collaboration and license agreement with Nobelpharma for a reciprocal worldwide exclusive license under existing IP to develop, manufacture, and commercialize sialic acid products. Nobelpharma's licensed territory includes Japan and certain other Asian countries, and Ultragenyx's licensed territory includes ROW. The parties conduct development independently. Under the agreement, Ultragenyx paid Nobelpharma a $110,000 upfront fee and $495,000 in development milestone payments. Ultragenyx also issued 76,567 shares of common stock to Nobelpharma and will pay Nobelpharma a high-single-digit royalty on net sales in its territory. Nobelpharma will pay Ultragenyx a mid-single-digit royalty on net sales in their territory (ex-Japan).

AAI Pharma

In March 2011, Ultragenyx entered into a license agreement with AAI Pharma (AAI) under which AAI granted Ultragenyx a license to use AAI's controlled release matrix solid dose oral tablet technology in sialic acid products for the treatment of HIBM. Under the agreement, Ultragenyx will pay a mid-single-digit percentage of any sublicense revenue received related to the sublicense of AAI Pharma technology and agreed to provide preclinical and clinical data to AAI Pharma.

HIBM Research Group

In April 2012, Ultragenyx entered into an exclusive license agreement with HIBM Research Group (HRG) for IP related to the treatment of HIBM using substrate replacement therapy. Under the terms of agreement, Ultragenyx paid HRG an upfront fee of $25,000 and will make future development and milestone payments of up to $300,000 in aggregate. Additionally, Ultragenyx will pay a royalty of <1% of net sales of SA-ER.

Manufacturing

The drug substance for SA-ER is currently manufactured by Sanyo Fine Co., Ltd. in Japan under the license agreement with Nobelpharma. The drug product for SA-ER is manufactured by AAI under the aforementioned license agreement. Ultragenyx is in the process of identifying secondary sources of drug substance and product. Manufacture of the drug substance requires a specialized enzyme-catalyzed step, and

a secondary source of the enzyme itself is also under development. All raw materials to produce the drug substance and product are commercially available. The cell line to produce the specialized enzyme is under Ultragenyx' control and stored in multiple secured locations.

Intellectual property

With respect to SA-ER, none of the patents cover composition of matter. Ultragenyx has 10 pending U.S. applications and patents and applications in other jurisdictions covering the use of sialic acid for the treatment of HIBM, biomarkers useful for such treatment, as well as extended release formulations of sialic acid. The projected patent terms for pending applications in the United States are from 2028 to 2034. SA-ER has received orphan drug designation in both the US and EU.

Figure 25: Revenue model

SA-ER Revenue Build

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
US SA-ER Revenue Build															
# of HIBM Pts	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414
Penetration Rate	*3%*	*10%*	*25%*	*40%*	*55%*	*60%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*
# Treated	12	40	101	161	222	243	264	265	265	266	267	267	268	268	269
SA-ER Cost/Yr	90000	91800	93636	95509	97419	99367	101355	103382	105449	105449	105449	105449	105449	105449	105449
Total US SA-ER Sales ('000)	$ 1,080	$ 3,681	$ 9,410	$ 15,396	$ 21,646	$ 24,146	$ 26,747	$ 27,350	$ 27,965	$ 28,034	$ 28,102	$ 28,171	$ 28,239	$ 28,308	$ 28,376
Total US SA-ER Sales ('000)	**$ 1,080**	**$ 3,681**	**$ 9,410**	**$ 15,396**	**$ 21,646**	**$ 24,146**	**$ 26,747**	**$ 27,350**	**$ 27,965**	**$ 28,034**	**$ 28,102**	**$ 28,171**	**$ 28,239**	**$ 28,308**	**$ 28,376**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
EU SA-ER Revenue Build															
# of HIBM Pts	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614
Penetration Rate	*0%*	*3%*	*10%*	*25%*	*40%*	*55%*	*60%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*	*65%*
# Treated	0	18	60	151	242	333	364	395	395	396	397	397	398	398	399
SA-ER Cost/Yr	75000	76500	78030	79591	81182	82806	84462	86151	87874	87874	87874	87874	87874	87874	87874
Total EU SA-ER Sales ('000)	$ -	$ 1,379	$ 4,697	$ 11,998	$ 19,614	$ 27,554	$ 30,710	$ 33,991	$ 34,728	$ 34,785	$ 34,842	$ 34,899	$ 34,956	$ 35,014	$ 35,071
Total EU SA-ER Sales ('000)	**$ -**	**$ 1,379**	**$ 4,697**	**$ 11,998**	**$ 19,614**	**$ 27,554**	**$ 30,710**	**$ 33,991**	**$ 34,728**	**$ 34,785**	**$ 34,842**	**$ 34,899**	**$ 34,956**	**$ 35,014**	**$ 35,071**

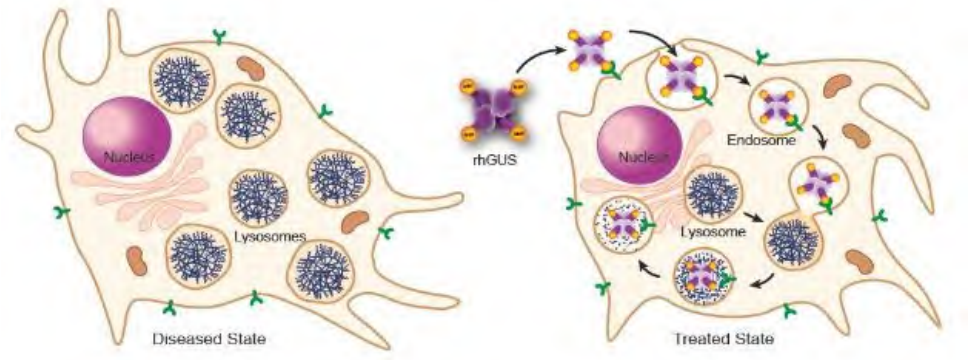
	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ROW SA-ER Revenue Build															
# of HIBM Pts	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614
Penetration Rate	*2%*	*7%*	*13%*	*20%*	*27%*	*33%*	*40%*	*47%*	*54%*	*60%*	*60%*	*60%*	*60%*	*60%*	*60%*
# Treated	12	40	80	121	161	202	242	285	328	365	366	367	367	368	368
SA-ER Cost/Yr	75000	76500	78030	79591	81182	82806	84462	86151	87874	87874	87874	87874	87874	87874	87874
Total ROW SA-ER Sales ('000)	$ 900	$ 3,065	$ 6,263	$ 9,599	$ 13,076	$ 16,699	$ 20,474	$ 24,578	$ 28,851	$ 32,109	$ 32,162	$ 32,215	$ 32,267	$ 32,320	$ 32,373
Total ROW SA-ER Sales ('000)	**$ 900**	**$ 3,065**	**$ 6,263**	**$ 9,599**	**$ 13,076**	**$ 16,699**	**$ 20,474**	**$ 24,578**	**$ 28,851**	**$ 32,109**	**$ 32,162**	**$ 32,215**	**$ 32,267**	**$ 32,320**	**$ 32,373**
Total SA-ER WW Sales ('000)	**$ 1,980**	**$ 8,126**	**$ 20,371**	**$ 36,993**	**$ 54,336**	**$ 68,399**	**$ 77,932**	**$ 85,919**	**$ 91,544**	**$ 94,928**	**$ 95,107**	**$ 95,285**	**$ 95,463**	**$ 95,642**	**$ 95,820**
Royalty to Noblepharma	1%	2%	3%	4%	5%	6%	7%	8%	9%	9%	9%	9%	9%	9%	9%
Total SA-ER Sales to Ultragenyx	**$ 1,960**	**$ 7,963**	**$ 19,760**	**$ 35,513**	**$ 51,619**	**$ 64,295**	**$ 72,476**	**$ 79,045**	**$ 83,305**	**$ 86,385**	**$ 86,547**	**$ 86,709**	**$ 86,872**	**$ 87,034**	**$ 87,196**

Source: Canaccord Genuity estimates

rhGUS (UX003) for the treatment of MPS 7

rhGUS (recombinant human β-glucuronidase) is an IV administered ERT in P3 development for the treatment of MPS 7 (a.k.a. Sly Syndrome). MPS 7 is caused by a deficiency of the lysosomal enzyme β-glucuronidase, which breaks down the GAGs dermatan sulfate (DS) and heparan sulfate (HS). These GAGs are a critical component of many tissues in the body. MPS 7 has a wide spectrum of clinical manifestations and can present as early as at birth. Patients with MPS 7 suffer from severe multi-system disease (hepatic, pulmonary), pervasive skeletal disease (joint stiffness), and early death in the teens to 30s. The most severe form of MPS 7 presents at birth with newborn hydrops fetalis, a severe condition of fluid retention throughout the body (n= <1/yr). Diagnosis is made by leukocyte enzyme assay. One of the rarest MPS diseases, MPS 7 prevalence is just ~200 patients in the developed world. Ultragenyx has identified ~90 potential MPS 7 patients worldwide to date. There are currently no approved drugs for MPS 7. rhGUS replaces the deficient β-glucuronidase enzyme to clear GAG accumulation. RhGUS has received orphan drug designation in both the US and EU.

Figure 26: rhGUS mechanism of action



Source: Company reports

About MPS

Collectively, the mucopolysaccharidoses (MPS) are a group of rare, inherited LSDs caused by an absence or deficiency of certain lysosomal enzymes. These enzymes are responsible for breaking down complex sugars called glycosaminoglycans (GAG). GAGs serve as building blocks for connective tissue in the body. Without the necessary lysosomal enzymes, GAGs accumulate in the body's cells, organelles, and tissues. MPS consists of seven separate metabolic disorders (types I to VII) and each disorder is associated with a distinct enzyme deficiency. The estimated combined incidence of MPS is 1:20,000. MPS III is the most common form, occurring in approximately 1:70,000 newborns. ERTs are well-established in MPS, with four approved for other MPS disorders: MPS 1 (Aldurazyme – BioMarin/Genzyme), MPS 2 (Elaprase - Shire), MPS 4A (VIMIZIM - BioMarin), and MPS 6 (Naglazyme - BioMarin).

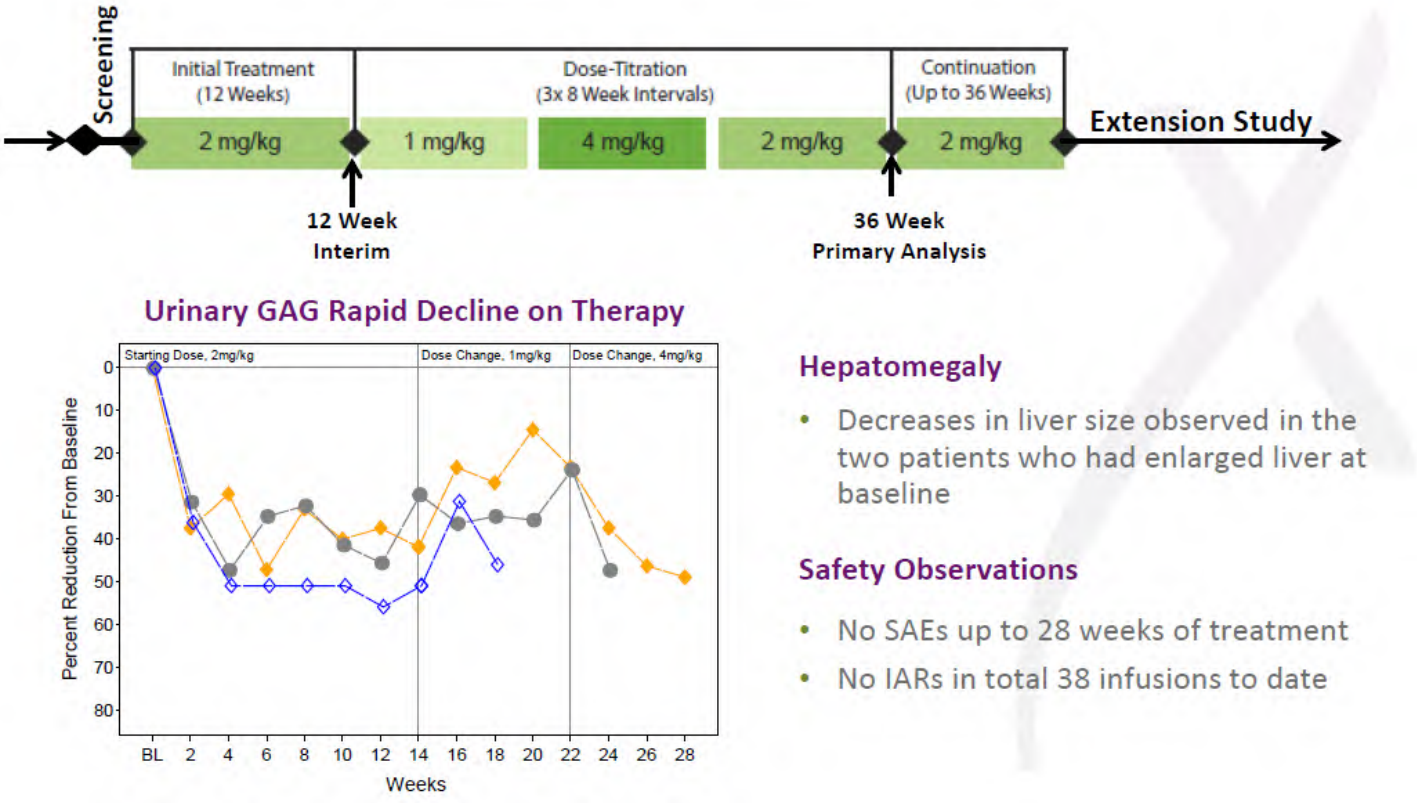
Clinical data

In December 2013, Ultragenyx initiated an open-label, P1/2 study in the UK to evaluate the safety, tolerability, efficacy, and dose of bi-weekly IV administration of RhGUS (2 mg/kg) in up to five patients with MPS 7 between five and 30 years of age.

Positive interim results from the study were announced in September 2014 at the SSIEM Annual Symposium in Innsbruck, Austria. Results demonstrated both rapid and

sustained reductions in urinary GAG excretion as well as reduction in liver size. The reduction in urinary GAG excretion was observed by two weeks after first dose and declined by a solid ~40-50% from baseline after 12 weeks. Decreases in liver size were observed in the two patients who had enlarged livers at baseline. No SAEs were observed in the 12-week primary analysis phase and through up to 28 total weeks of treatment. The most common AEs reported were infections and GI disorders. No infusion-associated reactions (IARs) have been observed after a total of 38 doses.

Figure 27: rhGUS P1/2 results

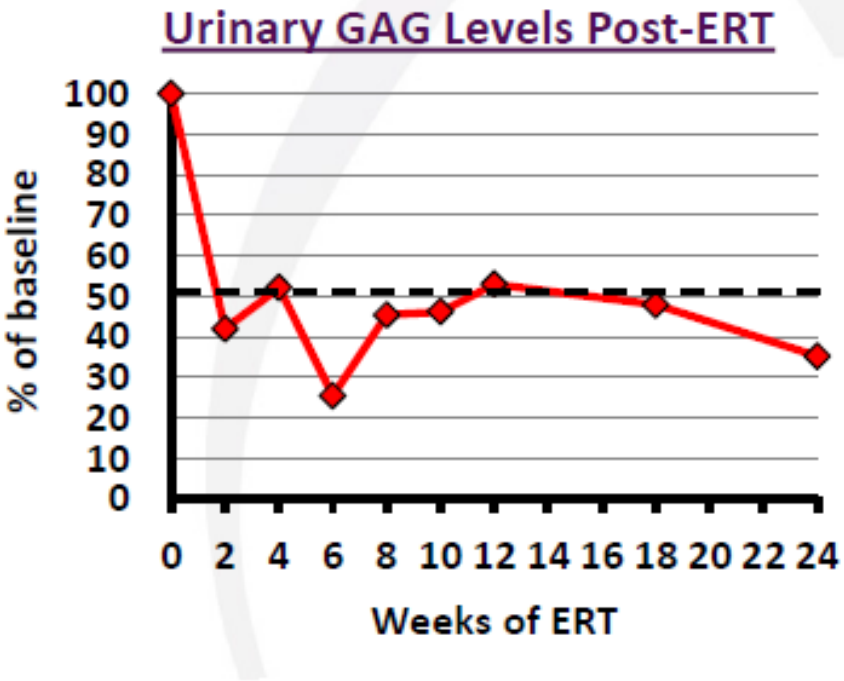


Source: Company reports

Separately, a single 12-year-old patient with pulmonary decline pre-treatment continues to be treated under an emergency IND in a New York hospital. At baseline, the patient had an enlarged liver and spleen, hearing loss, heart valve abnormalities, fatigue and worsening pulmonary status and ventilator dependence. Through 24 weeks of treatment, the patient demonstrated: an impressive 50-70% decline in urinary GAG excretion, a sustained reduction in liver and spleen size and physician reported enhanced QOL (increased time in school/oral food intake). In addition, this patient has shown improved pulmonary function based on reduced carbon dioxide retention and decreased time on a ventilator. No SAEs or IARs have been observed through 12 infusions.

Figure 28: Single patient eIND treated with rhGUS

TIME	LIVER	SPLEEN
PRE	~2 cm below umbilicus	Tip in groin
2 wks	~1 cm above umbilicus	At umbilicus
8 wks	~1 cm above umbilicus	At umbilicus
12 wks	Above umbilicus	Above umbilicus
24 wks	~2 cm below costal margin	Palpable spleen tip



Source: Company reports

Development status

Based on these positive results, Ultragenyx initiated a placebo-controlled pivotal P3 study in December 2014. We expect P3 data in 1H16. In addition, we expect 36-week data from the P1/2 study to be presented at the LDN World Symposium in February 2015. The 36-week update should provide clarity on the decision to move forward with the 4mg/kg dose.

The P3 study is a global, randomized, placebo-controlled, blind-start trial assessing rhGUS (4mg/kg bi-weekly) efficacy and safety in 12 patients between five and 35 years of age over 48 weeks. Patients will be randomized to one of four groups, with one cohort receiving rhGUS immediately while the other three start on placebo and cross over to rhGUS at predefined time points in a blinded manner. This design improves the statistical power of the study compared to a traditional parallel-group design. All groups will receive a minimum of 24 weeks of treatment with rhGUS. The primary endpoint is reduction in urinary GAG after 24 weeks. Additional endpoints include safety and tolerability, pulmonary function, walking, stair climb, shoulder flexion, fine and gross motor function, hepatosplenomegaly, cardiac size and function, visual acuity, patient and caregiver assessment of most significant clinical problems, global impressions of change, a multi-domain responder index, and other endpoints.

Per FDA agreement, the evaluation of the pivotal P3 study will be based on the totality of the data on a patient-by-patient basis. FDA advised against declaring a primary clinical endpoint in order to allow for more flexibility in the overall efficacy evaluation The EMA has agreed that approval under exceptional circumstances may be possible based upon a single positive P3 study using urinary GAG excretion as the primary endpoint, with a trend toward improvement in the most important clinical endpoints (6MWT, FEV, spleen/liver volume).

Intellectual property

Ultragenyx has no issued patents covering rhGUS but has filed one U.S. application directed to compositions. The company also intends to file patent applications directed to dosage, regiment, formulation, and manufacturing, etc. In addition, Ultragenyx intends to pursue marketing and orphan drug exclusivity periods available in certain countries. rhGUS has received orphan drug designation in both the US and EU.

Competitive landscape

With respect to rhGUS, we are not aware of any other compounds currently in clinical development for MPS 7

Partnership collaboration

In November 2010, Ultragenyx entered into a license agreement with Saint Louis University for exclusive worldwide rights to IP related to GUS and by extension the company's rhGUS product candidate. In exchange, Ultragenyx paid SLU an up-front fee of $10,000, and will make a milestone payment of $100,000 upon approval of rhGUS for MPS 7. In addition, Ultragenyx will pay SLU a low-single-digit royalty on net sales based on achievement of certain cumulative worldwide sales thresholds.

Manufacturing

rhGUS is manufactured by Rentschler Biotechnologie GmbH (Rentschler) under a development and clinical supply agreement executed in August 2012. The cell line to produce rhGUS is specific for this product and is in Ultragenyx' control and stored in multiple secure locations. All other raw materials are commercially available.

Figure 29: Revenue model

rhGUS Revenue Model

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
US rhGUS Revenue Build															
# of MPS 7 Pts	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Penetration Rate	*10%*	*40%*	*60%*	*80%*	*91%*	*92%*	*93%*	*93%*	*93%*	*93%*	*93%*	*93%*	*93%*	*93%*	*93%*
# Treated	3.5	14.4	22	30	35	37	38	39	40	41	42	43	44	45	46
rhGUS Cost/Yr	450000	459000	468180	477544	487094	496836	506773	516909	527247	527247	527247	527247	527247	527247	527247
Total US rhGUS Sales ('000)	$ 1,575	$ 6,610	$ 10,394	$ 14,517	$ 17,287	$ 18,284	$ 19,323	$ 20,190	$ 21,085	$ 21,575	$ 22,065	$ 22,556	$ 23,046	$ 23,536	$ 24,027
Total rhGUS US Sales	**$ 1,575**	**$ 6,610**	**$ 10,394**	**$ 14,517**	**$ 17,287**	**$ 18,284**	**$ 19,323**	**$ 20,190**	**$ 21,085**	**$ 21,575**	**$ 22,065**	**$ 22,556**	**$ 23,046**	**$ 23,536**	**$ 24,027**

	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ROW rhGUS Revenue Build															
# of MPS 7 Pts	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
Penetration Rate	*5%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*80%*	*80%*	*80%*	*80%*	*80%*	*80%*	*80%*
# Treated	8	33	50	67	85	102	120	138	138	139	140	141	142	142	143
rhGUS Cost/Yr	400000	408000	416160	424483	432973	441632	450465	459474	468664	468664	468664	468664	468664	468664	468664
Total ROW rhGUS Sales ('000)	$ 3,300	$ 13,546	$ 20,850	$ 28,525	$ 36,586	$ 45,046	$ 53,921	$ 63,224	$ 64,863	$ 65,238	$ 65,613	$ 65,988	$ 66,363	$ 66,738	$ 67,113
Total rhGUS EU Sales	**$ 3,300**	**$ 13,546**	**$ 20,850**	**$ 28,525**	**$ 36,586**	**$ 45,046**	**$ 53,921**	**$ 63,224**	**$ 64,863**	**$ 65,238**	**$ 65,613**	**$ 65,988**	**$ 66,363**	**$ 66,738**	**$ 67,113**
Total rhGUS WW Sales	**$ 4,875**	**$ 20,155**	**$ 31,243**	**$ 43,043**	**$ 53,873**	**$ 63,330**	**$ 73,244**	**$ 83,414**	**$ 85,948**	**$ 86,813**	**$ 87,678**	**$ 88,543**	**$ 89,409**	**$ 90,274**	**$ 91,139**
Royalty to St. Louis U.	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*
Total rhGUS Net Sales to Ultragenyx	**$ 4,778**	**$ 19,752**	**$ 30,618**	**$ 42,182**	**$ 52,796**	**$ 62,063**	**$ 71,779**	**$ 81,746**	**$ 84,229**	**$ 85,077**	**$ 85,925**	**$ 86,773**	**$ 87,621**	**$ 88,469**	**$ 89,316**

Source: Canaccord Genuity Estimates

rhPPCA (UX004) for galactosialidosis

rhPPCA is an ERT in preclinical development for galactosialidosis, a rare LSD clinically similar to MPS 7 in presentation (i.e. enlarged liver, joint disease, abnormal bone development, short stature, and early death). The drug is a recombinant human protective protein cathepsin-A (rhPPCA). In patients with galactosialidosis, a mutation in the CTSA gene leads to deficiency of native PPCA enzyme and results in accumulation of substrates in the lysosomes, causing the clinical manifestations of the disease. While an infant form has been described, most cases have been observed in the juvenile/adult group of patients. There are no currently approved drug therapies for galactosialidosis.

Development status

Ultragenyx is continuing preclinical development of rhPPCA. Meanwhile, The St. Jude Children's Research Hospital (St. Jude) is conducting in observational study to characterize the patient population with galactosialidosis in terms of clinical presentation and prevalence. Information from this study will facilitate development of eligibility criteria for future therapeutic studies. The goal is to file an IND for rhPPCA in the 2016 timeframe.

Intellectual property

Ultragenyx does not have issued patents or patent applications filed for rhPPCA. The company believes it is partially protected by proprietary know-how licensed from St. Jude Children's Hospital and intends to build a patent portfolio around ERTs for LSD treatments, as well as pursue marketing and orphan drug exclusivity periods.

Competitive landscape

We are not aware of any other compounds currently in clinical development for galactosialidosis, or any that would compete with rhPPCA. St. Jude Children's Hospital has a robust gene therapy program that has demonstrated clinical success in hemophilia B and may be working on a gene therapy program for galactosialidosis as well.

Partnership/collaboration overview

In September 2012, Ultragenyx entered into a license agreement with St. Jude for exclusive rights to IP related to rhPPCA. In exchange, Ultragenyx paid St. Jude an upfront fee of $10,000 and agreed to pay a royalty of <1% on net sales of any approved products for so long as such products retain orphan drug exclusivity, on a country-by-country basis.

Manufacturing

No supplier has been selected for rhPPCA. The cell line used to produce rhPPCA is specific for this product and is in Ultragenyx control and stored in multiple secure locations.

Financials

At the end of 3Q14, Ultragenyx had $201.2 million in cash, cash equivalents, and short term investments on its balance sheet and no debt. Based on the current burn rate, we model for raises in late 2015 and again in 2017.

Management

Emil D. Kakkis, M.D., Ph.D., Chief Executive Officer and President

Dr. Kakkis is Ultragenyx's President and Chief Executive Officer. He is also President of the non-profit EveryLife Foundation for Rare Diseases. He began his work developing an enzyme replacement therapy (Aldurazyme) for the rare disorder MPS I. After joining BioMarin in 1998, Dr. Kakkis guided the development and approval of two more treatments for rare disorders, MPS VI and PKU. Dr. Kakkis went on to found Ultragenyx in 2010. Dr. Kakkis is board certified in both Pediatrics and Medical Genetics. He graduated from Pomona College, magna cum laude and received the Vaile Prize for his research. He received combined M.D. and Ph.D. degrees from the UCLA Medical Scientist Program and received the Bogen Prize for his research. He completed a Pediatrics residency and Medical Genetics Training Fellowship at Harbor-UCLA Medical Center from 1989-1993 and from 1993 to 1998 was an assistant professor of Pediatrics at Harbor-UCLA Medical Center where he initiated the enzyme therapy program for MPS I.

Thomas Kassberg, Chief Business Officer and Senior Vice President

Mr. Kassberg joined Ultragenyx in November 2011. He is responsible for leading the company's business development and corporate strategic planning activities, as well as the human resources and legal affairs functions. Prior to joining Ultragenyx, Mr. Kassberg worked as an independent consultant in Corporate Development and Business Strategy and consulted with a number of companies, including Corium International, Inc. and Rib-X Pharmaceuticals, Inc. Before becoming a consultant, Mr. Kassberg worked at Proteolix, Inc., where he served as Executive Vice President of Corporate Development. Prior to Proteolix, Mr. Kassberg served as Senior Vice President of Corporate Development and Commercial Operations at InterMune, Inc. Mr. Kassberg was also a co-founder of Plexxikon, where he served as Vice President, Business and Corporate Development. Prior to Plexxikon, Mr. Kassberg served as the Senior Director of Business Development and Corporate Licensing at SUGEN until the company's acquisition by Pharmacia. Mr. Kassberg began his career at Bristol-Myers Squibb where he held a variety of positions in strategic planning, managed care sales, and financial and product analysis. He holds an M.B.A. from Northwestern University and a B.A. in Economics and Management from Gustavus Adolphus College.

Shalini Sharp, Chief Financial Officer and Senior Vice President, Finance

Ms. Sharp joined Ultragenyx in May 2012 as Chief Financial Officer and Senior Vice President, Finance. Ms. Sharp is a member of the Board of Directors of Agenus Inc. (formerly Antigenics Inc.), where she served as Chief Financial Officer from 2006 to 2012. She joined Agenus in 2003 and held increasing roles of responsibility spanning strategic planning, corporate development, investor relations, corporate finance and business development. Prior to Agenus, Ms. Sharp held similar roles at Elan Pharmaceuticals from 1998 to 2003, including serving as chief of staff to the Chairman of the Board of Directors during that company's restructuring. Prior to Elan, Ms. Sharp was a management consultant at McKinsey & Company as well as an investment banker at Goldman Sachs, specializing in pharmaceuticals and medical devices. Ms. Sharp holds both a BA, magna cum laude, and MBA from Harvard University.

Sunil Agarwal, M.D., Chief Medical Officer and Senior Vice President

Sunil Agarwal, M.D. joined Ultragenyx as Chief Medical Officer in August 2014. Prior to Ultragenyx, Dr. Agarwal held the position of Senior Vice President and Global Head of Clinical Development for OMNI (Ophthalmology, Metabolism, Neurosciences, Immunology and Infectious Diseases) since January 2013. Prior to that, Dr. Agarwal held the positions of Senior VP for Immunology and Infectious Diseases, and VP for Rheumatology from July 2009 to December 2012. He also held the position of VP of Genentech Drug Safety from January 2009 to July 2009. Before joining Genentech, Dr. Agarwal was at MedImmune and Guilford Pharmaceuticals. Dr. Agarwal obtained his Bachelor of Science in Neuro-Biology at Cornell University and then earned his medical degree from Tufts University School of Medicine. He completed his residency at Children's National Medical Center (CNMC), Washington, D.C. and subsequently joined the facility at George Washington University School of Medicine as an Assistant Clinical Professor of Pediatrics. He practiced in the Pediatric Emergency Department at CNMC.

Income statement

Figure 30: Income Statement

Ultragenyx Pharmaceutical
(NASDAQ: RARE)

Adam A. Walsh, M.D.
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Consolidated Income Statement
($thousands, except per share data)

	FY 2013A	Mar 1Q14A	Jun 2Q14A	Sep 3Q14A	Dec 4Q14E	FY 2014E	FY 2015E	FY 2016E	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E	FY 2022E	FY 2023E
Revenue															
Total KRN23 WW Sales	-	-	-	-	-	-	-	-	-	-	7,500	183,110	349,626	524,792	713,541
Total rhGUS WW Sales	-	-	-	-	-	-	-	-	-	-	4,875	20,155	31,243	43,043	53,873
Total Trihep LC-FAOD WW Sales	-	-	-	-	-	-	-	-	-	-	16,046	43,656	66,811	90,887	115,911
Total Trihep GLUT1 DS WW Sales	-	-	-	-	-	-	-	-	-	-	20,685	70,345	143,538	219,665	298,815
Total SA-ER WW Sales	-	-	-	-	-	-	-	-	-	-	1,980	8,126	20,371	36,993	54,336
Total product revenue	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**51,086**	**325,393**	**611,590**	**915,380**	**1,236,476**
Net Revenue to Ultragenyx															
Total KRN23	-	-	-	-	-	-	-	-	-	-	3,750	59,584	119,306	183,249	252,106
Total rhGUS	-	-	-	-	-	-	-	-	-	-	4,778	19,752	30,618	42,182	52,796
Total Trihep LC-FAOD	-	-	-	-	-	-	-	-	-	-	15,244	41,473	63,471	86,343	110,116
Total Trihep GLUT1 DS	-										19,651	66,828	136,362	208,682	283,874
Total SA-ER											1,960	7,963	19,760	35,513	51,619
Total Net Revenue to Ultragenyx	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**45,382**	**195,600**	**369,516**	**555,969**	**750,511**
COGS	-	-	-	-	-	-	-	-	-	-	1,361	11,736	33,256	66,716	90,061
Gross profit	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	44,021	183,864	336,260	489,253	660,449
Operating expense															
R&D (GAAP)	27,829	8,353	11,239	12,854	13,500	45,946	61,660	74,360	81,180	86,070	87,791	89,547	91,338	93,165	95,028
SG&A (GAAP)	4,451	1,986	2,422	2,981	3,500	10,889	16,100	20,700	33,430	40,530	42,557	43,195	43,843	44,500	45,168
Stock-based compensation	*657*	*795*	*946*	*1,652*	-	*3,393*	-	-	-	-	-	-	-	-	-
Total operating expense (GAAP)	32,280	10,339	13,661	15,835	17,000	56,835	77,760	95,060	114,610	126,600	130,348	132,742	135,181	137,665	140,196
Operating income (loss)	**(32,280)**	**(10,339)**	**(13,661)**	**(15,835)**	**(17,000)**	**(56,835)**	**(77,760)**	**(95,060)**	**(114,610)**	**(126,600)**	**(86,327)**	**51,122**	**201,079**	**351,587**	**520,253**
Interest income	216	93	149	171	-	413	5,193	2,017	2,951	3,403	1,677	2,699	6,721	13,752	24,158
Interest expense	-	-		-	-	-	-	-	-	-	-	-	-	-	-
Other income (expense), net	(3,006)	(3,384)	(73)	(185)	-	(3,642)	-	-	-	-	-	-	-	-	-
Total other (expense) income, net	(2,790)	(3,291)	76	(14)	-	(3,229)	5,193	2,017	2,951	3,403	1,677	2,699	6,721	13,752	24,158
Net gain (loss) before taxes	(35,070)	(13,630)	(13,585)	(15,849)	(17,000)	(60,064)	(72,567)	(93,043)	(111,659)	(123,197)	(84,651)	53,821	207,800	365,340	544,411
Income Tax Provision	-	-	-	-	-	-	-	-	-	-	-	1,076	10,390	36,534	81,662
Net income (loss) attributable to common s	**$ (50,289)**	**$ (18,438)**	**$ (13,585)**	**$ (15,849)**	**$ (17,000)**	**$ (60,064)**	**$ (72,567)**	**$ (93,043)**	**$ (111,659)**	**$ (123,197)**	**$ (84,651)**	**$ 52,745**	**$ 197,410**	**$ 328,806**	**$ 462,749**
EPS (basic and diluted)	**$ (14.87)**	**$ (0.85)**	**$ (0.45)**	**$ (0.50)**	**$ (0.53)**	**$ (1.87)**	**$ (1.94)**	**$ (2.43)**	**$ (2.78)**	**$ (2.98)**	**$ (2.03)**	**$ 1.20**	**$ 4.45**	**$ 7.34**	**$ 10.23**
Weighted shares outstanding (basid and diluted)	3,382	21,582	30,056	31,631	32,104	32,104	37,501	38,214	40,214	41,298	41,711	43,895	44,334	44,777	45,225
Margin Analysis															
Total COGS	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	3%	6%	9%	12%	12%
Gross margin	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	97%	94%	91%	88%	88%
R&D (GAAP)	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	193%	46%	25%	17%	13%
SG&A (GAAP)	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	94%	22%	12%	8%	6%
Total operating expense	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	287%	68%	37%	25%	19%
Operating margin	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	-190%	26%	54%	63%	69%
Income tax provision	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	5%	10%	15%
Net margin (GAAP)	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	-187%	27%	53%	59%	62%
% Change Y/Y															
Total revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	331%	89%	50%	35%
KRN23 revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	1489%	100%	54%	38%
rhGUS revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	313%	55%	38%	25%
Triheptanoin LC-FAOD revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	172%	53%	36%	28%
Triheptanoin GLUT1 DS revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	240%	104%	53%	36%
SA-ER revenue	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	306%	148%	80%	45%
R&D (GAAP)	120%	47%	58%	90%	n/a	65%	34%	21%	9%	6%	2%	2%	2%	2%	2%
SG&A (GAAP)	33%	83%	131%	198%	n/a	145%	48%	29%	61%	21%	5%	1%	1%	1%	1%
Total operating expense	101%	53%	67%	104%	n/a	76%	37%	22%	21%	10%	3%	2%	2%	2%	2%
Operating income	101%	53%	67%	104%	n/a	76%	37%	22%	21%	10%	-32%	-159%	293%	75%	48%
Net income (loss)	157%	174%	60%	88%	n/a	19%	21%	28%	20%	10%	-31%	-162%	274%	67%	41%
GAAP EPS (diluted)	-6%	-75%	-86%	-81%	n/a	-87%	3%	26%	14%	7%	-32%	-159%	271%	65%	39%
Shares outstanding (diluted)	173%	nm	nm	nm	nm	849%	17%	2%	5%	3%	1%	5%	1%	1%	1%

Source: Canaccord Genuity Estimates

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Ultragenyx Pharmaceutical - RARE:

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	1072*	100.0%	

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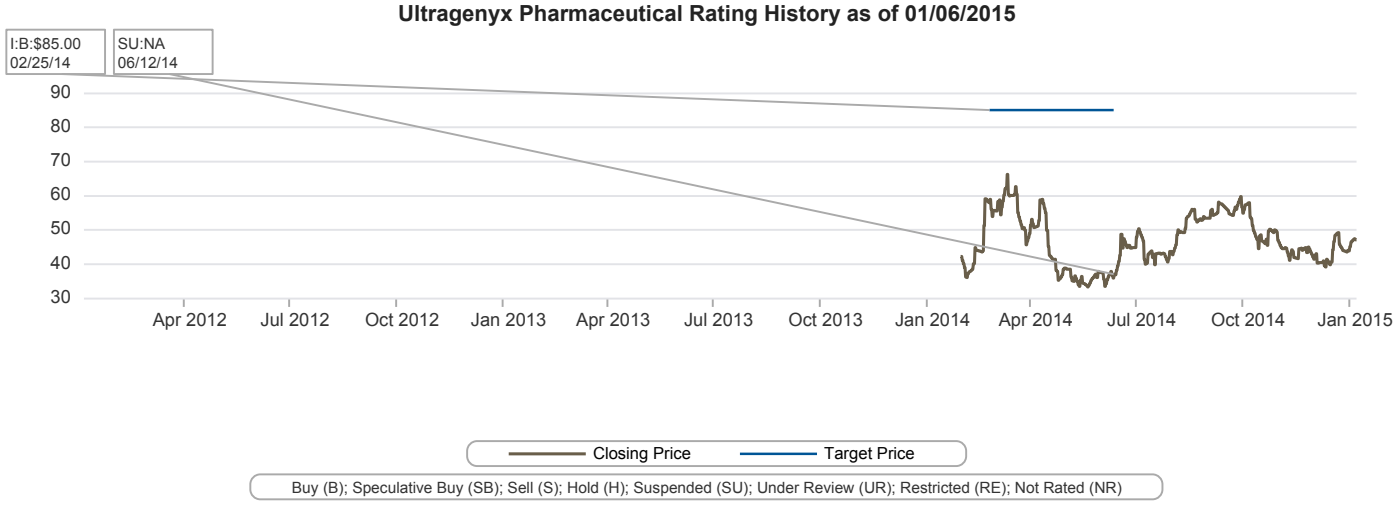

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