Rhythm Pharmaceuticals

Targeting MC4R pathway and transforming the care of patients with rare genetic diseases of obesity

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Forward Looking Statements

This presentation contains certain forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, and that involve risks and uncertainties, including without limitation statements regarding the potential, safety, efficacy, and regulatory and clinical progress of setmelanotide, including the anticipated timing for initiation of clinical trials and release of clinical trial data and our expectations surrounding potential regulatory submissions, approvals and timing thereof, our business strategy and plans, including regarding commercialization of setmelanotide, the application of genetic testing and related growth potential, expectations surrounding the potential market opportunity for our product candidates, the sufficiency of our cash, cash equivalents and short-term investments to fund our operations, and strategy, prospects and plans, including regarding the commercialization of setmelanotide. Statements using words such as "expect", "anticipate", "believe", "may" and similar terms are also forward-looking statements. Such statements are subject to numerous risks and uncertainties, including but not limited to, our ability to enroll patients in clinical trials, the outcome of clinical trials, the impact of competition, the ability to achieve or obtain necessary regulatory approvals, risks associated with data analysis and reporting, our liquidity and expenses, the impact of the COVID-19 pandemic on our business and operations, including our preclinical studies, clinical trials and commercialization prospects, and general economic conditions, and other risks as may be detailed from time to time in our Annual Reports on Form 10-K and Quarterly Reports on Form 10-Q and other reports we file with the Securities and Exchange Commission. Except as required by law, we undertake no obligations to make any revisions to the forward-looking statements contained in this presentation or to update them to reflect events or circumstances occurring after the date of this presentation, whether as a result of new information, future developments or otherwise.



Transforming Care of Patients with Rare Genetic Diseases of Obesity

INCIVERE®FDA-approved in November 2020(setmelanotide) injectionEC marketing authorization received July 2021



Commercial availability in U.S. meeting expectations and market access advancing in key **international markets**

Poised to deliver on Bardet-Biedl in	
the near-term	





Early-onset, Severe Obesity and Hyperphagia that Characterize Rare Genetic Diseases of Obesity

3 YEARS		11 YI	EARS, 231 POUNDS 2	3 years, 450 pounds
• NFANCY:	4 YEARS:	CHILDHOOD:	ADOLESCENCE:	23 years (current):
las "normal" weight at birth	Diagnosed with POMC	Self-isolation and missed school	Prescribed anti-depressants	Sleep apnea
Begins to rapidly gain weight at 9	heterozygous deficiency obesity	days	Numbness and agonizing back	Some cardiac issues
veeks		Asthmatic	pain	Insulin resistance
		Increased pain and pressure on her knees make play and physical education difficult	Abnormal pubertal developme	nt Cracked and bleeding skin
Lost in the system	Little knowledge or awareness	No tools, testing or treatment	<u>Worst case:</u> An in fault. Eat less,	rritation. It's your exercise more.



Rare Genetic Diseases of Obesity are Distinct from General Obesity

Genetic variants impair MC4R pathway, disrupting satiety signaling, caloric intake and energy expenditure



- Early-onset, severe obesity
- Hyperphagia: a pathological hunger associated with persistent and potentially extreme food-seeking behavior
- Genetically defined patient population
- Resistant or refractory to therapies and interventions, including bariatric surgery
- Multiple complications and co-morbidities associated with obesity



Rare Genetic Diseases of Obesity Associated with the MC4R Pathway Represent a Significant Market Opportunity

Estimated patients who may benefit from setmelanotide based on sequencing results and current estimated responder rates



* 1.7% of the US population (328M; 2019 US census) presents with severe early onset obesity (Hales et al 2018); ~95% of individuals with severe early onset obesity remain obese into adulthood (Ward et al 2017); ** Estimated prevalence of U.S. patients based on company estimates; £ Regulatory submission for BBS remain on track, but path forward for Alström syndrome is pending final analysis of full data from phase 3 trial; € Planned trial would include patients with variants classified as pathogenic, likely pathogenic or of uncertain significance, and patients with N221D variant; †Estimated prevalence of U.S. patients with addressable variants of the MC4R.



MC4R Pathway Biology is Clear and Strong: Regulates Hunger, Caloric Intake, and Energy Expenditure, and, Consequently, Body Weight

Setmelanotide can redress MC4R pathway impairment contributing to early-onset, severe obesity





Executing on Gene-by-gene Strategy to Expand Reach of Setmelanotide

Genes Approved	Genes for Regulatory Submission	Genes in Develoj	Genes in Clinical Development	
		Phase 2	Phase 3	
POMC	POMC BBS (all)	21	POMC	
PCSK1	ALMS1	51	PCSK1	
LEPR		additional genes related to MC4R pathway	LEPR	
(biallelic)			SRC1	
			SH2B1	
		(heterozygou allele va	us or single riants)	

Setmelanotide lifecycle advancements

Pediatrics patients (2-6 years old) and weekly formulation



Synergistic Strategy Drives Patient Finding for Clinical Trials and Commercialization





Rhythm Leadership – Strong Team with Broad Biopharma Experience

David Meeker, MD Chair, President and Chief Executive Officer	Hunter Smith Chief Financial Officer	Yann Mazabraud Executive Vice President, Head of International	Jennifer Chien Executive Vice President, Head of North America	Murray Stewart, MD Chief Medical Officer
SANOFI GENZYME	Celgene	SANOFI GENZYME trevi therapeutics		novelion HERAPEUTICS
25-plus years; focus on rare genetic disease treatments, including Aldurazyme®, Fabrazyme® and Myozyme®	Financial leadership for Otezla®; 20-plus years in finance, M&A, capital markets	20 years leading global commercial strategy in rare diseases	More than 20 years leading global commercial strategy in rare diseases	20-plus marketed products and NDAs 10-plus INDs



IMCIVREE[®] (setmelanotide) Commercially available in the United States; Received EC authorization in July 2021



U.S. and EU Approvals of IMCIVREE Based on Phase 3 Data from Largest Studies Conducted in Obesity due to POMC, PCSK1 or LEPR Deficiency

POMC/PCSK1



Supplemental patients:

 100% of POMC (4) and LEPR (4) supplemental patients achieved >10% weight loss*

Long-term extension study:

12 of 15 eligible POMC patients enrolled *

LEPR

12 of 15 eligible LEPR patients enrolled *

BL, baseline; PCSK1, proprotein convertase subtilisin/kexin type 1; POMC, proopiomelanocortin; FV, final visit; V, visit. ⁺N=9 POMC participants and N=7 LEPR participants who achieved weight loss threshold (5 kg or 5% if <100 kg) after the first open-label active treatment phase. **Reference:** IMCIVREE Prescribing Information; * Data as of Nov. 16, 2020 cutoff as presented Dec. 22, 2020, corporate conference call.



IMCIVREE U.S. Commercial Availability Strategy Meeting Expectations





Market Access and Reimbursement in Key International Markets on Track with First Commercial Sales expected in 1H 2022





Bardet-Biedl and Alström Syndrome U.S. and EU regulatory filings planned for 3Q/4Q 2021



Bardet-Biedl and Alström Syndromes Associated with Severe Obesity and Hunger





Alström syndrome^{2,3} Rare ciliopathy disorder associated with ALMS1 mutation

"Critical to treat obesity, absolutely critical!" – PCP⁴

References: 1. Forsythe E, Beales PL. Bardet-Biedl Syndrome. 2003 Jul 14 [Updated 2015 Apr 23]. In: Adam MP et al, eds. GeneReviews[®] [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2018. https://www.ncbi.nlm.nih.gov/books/NBK1363/. **2.** Marshall JD et al. *Curr Genomics*. 2011;12(3):225-235. **3.** Marshall JD et al. Alström Syndrome. 2003 Feb 7 [Updated 2012 May 31]. In: Adam MP et al, eds. GeneReviews[®] [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2018. https://www.ncbi.nlm.nih.gov/books/NBK1267/. **4.** From market reserach interviews.



Pivotal Phase 3 Data Supportive of Registration

Setmelanotide achieved statistical significance and delivered clinically meaningful weight loss and hunger reduction

Phase 3 Topline Data (n=31^a)

34.5%^b -6.2% -30.8% 60.2% **p=0.0024** p<0.0001 p<0.0001 p<0.0001 ≥10% weight ≥25% reduction mean weight mean hunger reduction in worst hunger loss score reduction

As presented on Dec. 22, 2020, reflecting data cut-off of Dec 2. 2020. ^aStudy participants older than 12 counted in full analysis set for primary and key secondary endpoints; Five participants were younger than 12, and two participants older than 12 discontinued during placebo-controlled period prior active therapy. ^bResponse rate estimated based on imputation methodology discussed with FDA.



Vast Majority of BBS Patients^{*} had Clinically Meaningful Response to Setmelanotide



*A total of 28 patients were older than 12 years old and included in the primary analysts set, 15 adults and 13 patients between the ages of 12 and 18; ** One patient was younger than 12 at enrollment and therefore not evaluable in for the primary endpoint; As presented on Dec. 22, 2020, corporate conference call, reflecting data cut-off of Dec 2. 2020, and as presented at The Endocrine Society Annual Meeting in March 2021.



Statistically Significant Body Weight Reduction Achieved in Adolescent and Adults Patients with BBS at Week 52



^aBaseline, n=16 and Week 52, n=14. ^bData shown by study visit do not include data imputed for participants who received <52 weeks of setmelanotide at the time of the primary analysis. BBS, Bardet-Biedl syndrome; BL, baseline; BMI, body mass index; SD, standard deviation. As presented at the annual meeting of the Pediatric Endocrine Society on April 30, 2021.



Field Force Now Engaging Established BBS Patient Community





- Engagement of current BBS treaters and diagnosers
- Disease education of HCPs to support appropriate evaluation and testing



Clinical Development: Meaningful Expansion of Addressable Patient Population



Rhythm Pipeline Designed to Achieve Label Expansion

		Phase 2	Phase 3	Regulatory Submission	Approved
	IMCI VREE™ (setmelanotide) injection	FDA approval and EC marketing authorization for POMC	, PCSK1 AND LEPF	R deficiency	
	Bardet-Biedl and Alström syndromes	sNDA and Type II MAA amendment on track for submiss	ion		
tide	EMANATE Trial	Five independent, genetically-defined sub-studies			
lano laily)	Pediatrics Trial	Open-label children 2- to 6-years old			
etme (d	Exploratory Basket Study	Ongoing study MC4R rescuable			
Se	Hypothalamic Obesity	Exploratory, open-label			
	DAYBREAK Trial	31 additional genes			
Weekly	Switch	Double-blind in patients with BBS, biallelic or heterozygous POM PCSK1 or LEPR deficiency	2,		
formulation	De novo	Double-blind, placebo-controlled in patients with BBS			



Parallel Operations to Support both EMANATE and DAYBREAK

IQVIA engaged as contract research organization

Site initiations set to begin in 3Q 2021

- All sites to service both trials
- 75+ sites in 14 countries in North America, Europe and the Middle East

Enrollment over 12 to 18 months

- First patient in for both trials expected in Q4 2021
- EMANATE 52 weeks to execute treatment period
 - Individual sub-studies may readout and potentially be registered independently
- DAYBREAK 40 weeks to execute treatment periods
 - Individual genes may readout independently

Uncovering Rare Obesity sponsored genetic test drives enrollment for clinical trials





Improved URO with Expanded Gene Panel Launched in July 2021



New HCP *website* to consolidate all information and operations



Data generated from URO as of June 2021



47.2 kg/m² Average BMI from adults



URO Geo-targeting and Referral Network Strategy to Drive Clinical Trial Enrollment



50 miles radius around target DAYBREAK and EMANATE trial sites

HCP URO tester (circle size reflects number of tests)

~650 patients

identified through who are eligible for enrollment in EMANATE or DAYBREAK trials and live within 50 miles of a clinical trial site



EMANATE Phase 3 Master Protocol Includes 5 Independent Sub-studies

110 patients per sub-study, 55 per arm (therapy and placebo)



Design allows for independent success in each sub-study



* Heterozygous; ** VUS= variant of uncertain significance

DAYBREAK Trial: Phase 2, Two-stage, Double-blind, Placebo-controlled Study to Evaluate Setmelanotide in 31 MC4R Pathway Genes





Phase 3 Trial in Pediatric Patients Ages 2 to 6 years old to Initiate 2H 2021

International one-year, open-label study

Enrollment: 10 patients

- 5 with biallelic POMC, PCSK1 or LEPR deficiency
- 5 with BBS

Primary endpoint: Responder analysis based on proportion of patients who experience a decrease in BMI-Z of ≥ 0.2

Secondary endpoints: Safety and tolerability

Rare genetic diseases of obesity often present early in life



Phase 3 Trials Evaluating Weekly Formulation of Setmelanotide to Initiate 2H 2021

Phase 3 randomized, double-blind switch study

- Enrollment: 30 patients with BBS or biallelic or heterozygous POMC, PCSK1 or LEPR deficiency who have who have been on open-label QD setmelanotide treatment for at least 6 months
- Randomized 1:1 for 13 weeks of double-blind randomization QD vs QW, crossover to 13 weeks open-label QW
- Primary endpoint: responder analysis, based on the proportion of patients with no weight gain of 5 percent or greater from baseline to week 13

Phase 3 de novo randomized, double-blind, placebo-controlled trial of once weekly formulation of setmelanotide

- Enrollment: 40 setmelanotide naïve patient with BBS (~60% adults)
- 18 weeks of double-blind administration of QW vs placebo, followed by 14 weeks of open-label QW administration of setmelanotide
- Primary endpoint: Mean change in weight compared to placebo

Weekly formulation of setmelanotide designed to improve compliance and adherence



Setmelanotide Generally Well-tolerated Across Development Program

Setmelanotide has been evaluated in 639 patients with obesity, with some individual patient treatment duration now exceeding five years

Setmelanotide has been generally well-tolerated Most AEs are mild:

- Mild injection site reactions
- Hyperpigmentation and skin lesions, mediated by the closely related MC1 receptor
- Nausea/vomiting: mild and early in treatment

Discontinuations are rare; no increase in CV parameters:

 In POMC and LEPR pivotal trials, setmelanotide was not associated with significant changes to blood pressure or heart rate

Patient experience with setmelanotide*

Duration on therapy	# of patients
< 1 year	545
> 1 year	94
> 2 years	40
> 3 years	17
> 4 years	3
> 5 years	2

* Data as of March 8, 2021, inclusive of trial participants who received daily or weekly formulation of setmelanotide.



Transformational Progress Expected in 2021

1H 2021

- ✓ Proof-of-concept data in HET patients, SRC1 and SH2B1 deficiency obesities
- Update on genetic sequencing and epidemiology data
- ✓ IMCIVREE commercially available in U.S. for POMC, PCSK1 and LEPR deficiency obesities
- ✓ Initiate Phase 2 trial in hypothalamic obesity

2H 2021

EU decision on POMC, PCSK1 and LEPR MAA

Present full data analyses from pivotal Phase 3 trial in BBS at ESPE 2021

U.S. and EU regulatory submissions for BBS and AS

Initiate Phase 3 trial in pediatric patients aged 2-6 years old

Initiate Phase 3 EMANATE trial

Initiate Phase 2 DAYBREAK trial

Initiate two Phase 3 trials for weekly formulation

1H 2022

Initial data from Phase 2 Basket study in MC4R-rescuable patients

Initial data from Phase 2 trial in hypothalamic obesity



Cash Expected to be Sufficient to Fund Operations into 2H 2023

SHARES OUTSTANDING as of 6/30/2021	50,209,484 (basic and diluted share count)
AUDITED ESTIMATED CASH, CASH EQUIVALENTS AND SHORT-TERM INVESTMENTS as of 6/30/2021	\$368.2 million



Appendix



Phase 2 Basket Study Evaluated Response at Three Months of Therapy



Primary endpoint is the proportion of patients who achieve >5% weight loss at 12 to 16 weeks on therapy.



^aFinal visit at week 20 for patients not enrolling in a separate extension study.

Clinical Characteristics of Patients Enrolled in Exploratory Phase 2 Basket Study

	HETS	SRC1 deficiency	SH2B1 deficiency
	Heterozygous POMC, PCSK1 or LEPR	obesity	obesity
	N= 35	N= 13 *	N= 17 *
Mean age	39 years old	32 years old	30 years old
(range)	(15 - 68)	(12 - 66)	(12 - 60)
Mean	316 lbs/	258 lbs/	272 lbs/
weight	143 kgs	117 kgs	123 kgs
Mean BMI	50 kg/m ²	44 kg/m ²	44 kg/m ²
	5 patients had failed	3 patients had failed	4 patients had failed
	bariatric surgery	bariatric surgery	bariatric surgery

* Completers Set excludes 15 patients who withdrew early due to COVID-related issues, AEs, or lost to follow-up; and 12 ongoing patients who had not reached 12 weeks of therapy. A majority of patients who withdrew early experienced weight loss.



Response Rate and Weight Loss at Month 3 (Overall) POMC/PCSK1/LEPR Heterozygous Deficiency Obesity

> 34.3% of patients (12/35) achieved the primary endpoint of ≥5% weight loss from baseline at Month 3*

	Baseline	Month 3	Percent change from baseline
Mean (SD) body weight:	144.7 kg	130.7 kg	-10.1% (4.4)
Responders (n=12)	(32.6)	(33.5)	

* Data include six patients who withdrew early, last observed value carried forward, as of Dec. 17, 2020.



Clear Separation of Responder, Non-responder Groups Supportive of Pathway Deficit in HETs



Change in Most Hunger Score at Month 3 and Over Time *POMC/PCSK1/LEPR Heterozygous Deficiency Obesity*



Data as of Dec. 17, 2020; Responder is defined by Month 3 weight loss; CI, confidence interval; Error bars represent the 90% CI.



Responses to Setmelanotide Were Maintained Through 6 and 9 Months



A responder was defined as having ≥5% weight loss from baseline at Month 3. Data as of December 17, 2020, for month 3 and as of February 23, 2021, for months 6 and 9; error bars are the 90% CI. CI, confidence interval.



ACMG Variant Classification Can Inform MC4R Pathway Deficit and Potentially Setmelanotide Response





*ACMG Guidelines Richards et al, 2015

Weight Loss at Month 3 by ACMG Subgroup in HETs

Pathogenic

Benign

Likely		Responders, n (%)ª	Non-responders, n (%)
Fattiogenic	Pathogenic/likely pathogenic (n=8)	4 (50.0)	4 (50.0)
VOUS	Variant of uncertain significance (n=19)	4 (21.1)	15 (78.9)
Likely Benign	N221D (n=8)	4 (50.0)	4 (50.0)

Data as of Dec. 17, 2020; CI, confidence interval; ACMG, American College of Medical Genetics. ^aAchieved the threshold of ≥5% weight loss from baseline at Month 3.



Response Rate and Weight Loss at Month 3 (Overall) SRC1 Deficiency Obesity – Completers Set

30.8% of patients (4/13) achieved the primary endpoint of ≥5% weight loss from baseline at Month 3

	Baseline	Month 3	Percent change from baseline
Mean (SD) body weight:	116.6 kg	106.4 kg	-8.4%
Responders (n=4)	(29.1)	(24.6)	(2.5)



Interim data as of Dec. 17, 2020.

Clear Separation of Responder, Non-responder Groups Supportive of Pathway Deficit in SRC1 – *Completers Set*





Response Rate and Weight Loss at Month 3 (Overall) SH2B1 Deficiency Obesity – Completers Set

52.9% of patients (9/17) achieved the primary endpoint of ≥5% weight loss from baseline at Month 3

	Baseline	Month 3	Percent change from baseline
Mean (SD) body weight:	123.6 kg	114.8 kg	- 7.1% (2.1)
Responders (n=9)	(28.1)	(26.4)	



Interim data as of Dec. 17, 2020.

Clear Separation of Responder, Non-responder Groups Supportive of Pathway Deficit in SH2B1 – Completers Set





New Paradigm: Targeted, Three-step Approach to Identifying and Treating Patients with Rare Genetic Diseases of Obesity

Phenotype

- Early-onset, severe obesity
- Adults: BMI>40
- Children: <18 yrs weight >97th percentile

Genotype

 Test positive for genetic variant in the MC4R pathway

Setmelanotide response

- 5% weight loss in adults in 12-16 weeks
- BMI-Z scores in children



EMANATE Endpoints to Illustrate Effect on Weight and Hunger

Secondary endpoints

- Proportion of patients who achieve at least 5% reduction in BMI at 52 weeks compared to placebo
- Proportion of patients who achieve at least 10% reduction in BMI at 52 weeks compared to placebo
- Difference in mean change in body weight at 52 weeks in adult patients (age ≥18 years at baseline) compared to placebo, assessed as percent change body weight
- Mean percent change in the weekly average most hunger score at 52 weeks compared to placebo
- Mean body weight loss, and % body weight loss in responders with ≥5% body weight loss (if >18 years of age), and a decrease in % BMI by 3% (if <18 years of age) after 12 weeks compared to placebo responders
- Mean change in symptoms of hyperphagia and mean change in impacts of hyperphagia at 52 weeks compared to placebo



DAYBREAK Phase 2 Trial Design and Endpoints Enable Rapid Path to Proof of Concept based on Individual Genes

Primary endpoint is the proportion of patients by gene who enter Stage 2 who are responders compared to placebo

- Responders >18 achieve 10% or greater body weight reduction from baseline
- Responders <18 achieve BMI reduction of > 0.3 from baseline

Secondary endpoints by gene

- Proportion of patients who meet 5% weight loss criteria to enter Stage 2 compared to historic rate of 5%
- Mean change and percent change in body weight in patients >18 compared to placebo
- Mean BMI-Z change in patients <18 compared to placebo
- Mean change in waist circumference in patients >12 compared to placebo
- Mean % change in weekly average hunger
- Overall safety and tolerability

Other secondaries: physical functioning scores and quality of life measures vs placebo



