UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d)
of the Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): September 4, 2018

AEGLEA BIOTHERAPEUTICS, INC.
(Exact name of registrant as specified in its charter)

Delaware	**001-37722**	**46-4312787**
(State or other jurisdiction of incorporation)	**(Commission File Number)**	**(IRS Employer Identification No.)**

901 S. MoPac Expressway
Barton Oaks Plaza One
Suite 250
Austin, TX **78746**
(Address of principal executive offices) **(Zip Code)**

(512) 942-2935
(Registrant's telephone number, including area code)

(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions:

☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)

☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)

☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))

☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§240.12b-2 of this chapter).

Emerging growth company ☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☒

Item 7.01 Regulation FD Disclosure.

On September 4, 2018, Aeglea BioTherapeutics, Inc. (the "Company") issued a press release announcing an enrollment status update and new interim Phase 1/2 clinical trial data demonstrating clinically relevant treatment effects in patients with Arginase 1 Deficiency, which will be presented in poster format at the 2018 Society for the Study of Inborn Errors of Metabolism (SSIEM) Annual Symposium in Athens, Greece, being held September 4-7, 2018. A copy of the press release and presentation poster are attached as Exhibits 99.1 and 99.2 to this report, respectively. The presentation poster will also be available on the Company's website in the Events & Presentations section at www.aegleabio.com.

The information furnished with this report, including Exhibits 99.1 and 99.2, shall not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended ("Exchange Act"), or otherwise subject to the liabilities of that section, nor shall it be deemed incorporated by reference into any other filing under the Securities Act of 1933, as amended, or the Exchange Act, except as expressly set forth by specific reference in such a filing.

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits

Exhibit Number	Description
99.1	Press Release issued by Aeglea BioTherapeutics, Inc. on September 4, 2018
99.2	Presentation Poster

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

AEGLEA BIOTHERAPEUTICS, INC.

Date: September 4, 2018

By: /s/ Charles N. York II
Charles N. York II
Chief Financial Officer

Exhibit 99.1

Aeglea BioTherapeutics Announces Positive Interim Clinical Data and Completion of Enrollment for Ongoing Phase 1/2 Trial of Pegzilarginase in Patients with Arginase 1 Deficiency

Exceeded Enrollment Target with 15 Patients in Phase 1/2 Trial

Additional Interim Data to be Presented at ASHG Conference in October 2018

Company Plans to Announce Pivotal Trial Design in Q4 2018 and Initiate Pivotal Trial in 1H 2019

Company to Host Clinical Update Conference Call Today at 8:30 a.m. ET

Austin, Texas, September 4, 2018 - Aeglea BioTherapeutics, Inc. (NASDAQ: AGLE), a clinical-stage biotechnology company that designs and develops innovative human enzyme therapeutics for patients with rare genetic diseases and cancer, today announced completion of enrollment and additional clinical data at the 2018 Society for the Study of Inborn Errors of Metabolism (SSIEM) Annual Symposium from its ongoing Phase 1/2 trial of pegzilarginase, its lead investigational therapy, in patients with the rare genetic disease Arginase 1 Deficiency (ARG1-D).

“I am thrilled that we exceeded our recruitment target in this Phase 1/2 trial of pegzilarginase by five patients, as enrollment completion is an important milestone for patients with ARG1-D,” said Anthony G. Quinn, M.B Ch.B, Ph.D., president and chief executive officer of Aeglea. “We are pleased to confirm our previous guidance of announcing the design of the first pivotal clinical trial for patients with ARG1-D in the fourth quarter of 2018 and initiating the pivotal trial in the first half of 2019.”

“Given the challenges of lowering arginine levels with current approaches, it is very encouraging to see the marked reductions in plasma arginine in our patient following treatment with pegzilarginase,” said George Diaz, M.D., Ph.D, professor and chief, Division of Medical Genetics, Icahn School of Medicine at Mount Sinai, and co-author on the presentation. “In addition, it is very exciting that we are seeing evidence of an impact on important disease manifestations with better walking, improved posture, and enhanced alertness.”

Highlights of the SSIEM presentation, entitled "Improvements in Arginase 1 Deficiency Related Disease Manifestations Following Plasma Arginine Reductions with Pegzilarginase," include the following:

- Administration of pezilarginase resulted in marked reductions in plasma arginine and related guanidino compounds (GCs);
- Clinical improvements in one or more instruments of neuromotor function in all three patients completing eight weeks of repeat dose administration;
- Pegzilarginase was generally safe and well tolerated; most treatment-related adverse events (AEs) were mild and all were resolved;
- No marked or sustained increase in ADA titers in patients exposed to pegzilarginase and initial evidence of rapid tolerization in patients with low titer ADAs.

The Company plans to present new interim clinical data for the Phase 1/2 trial at the 2018 American Society of Human Genetics (ASHG) Conference in October.

Conference Call & Webcast Details
Aeglea will hold a clinical update conference call today, Tuesday, September 4, 2018 at 8:30 a.m. ET. To access the live conference call via phone, please dial 1-877-709-8155 (toll free) within the United States, or 1-201-689-8881 internationally. A replay of the call will be available through September 11, 2018 by dialing 1-877-660-6853 within the United States or 1-201-612-7415 internationally. The conference ID is 13678293.

To access the live and archived webcast of the presentation, please visit the Presentations & Events section of the Aeglea BioTherapeutics investor relations website. Please connect to the website at least 15 minutes prior to the presentation to allow for any software download that may be necessary.

About Pegzilarginase in Arginase 1 Deficiency
Pegzilarginase is an enhanced human arginase that enzymatically depletes the amino acid arginine. Aeglea is developing pegzilarginase for the treatment of patients with Arginase 1 Deficiency, a debilitating urea cycle disorder caused by deficiency of a key arginine metabolizing enzyme that leads to severe and progressive hyperargininemia-related neurological abnormalities, hyperammonemia and early mortality. Pegzilarginase is intended for use as an enzyme replacement therapy in patients to reduce elevated blood arginine levels. The Company's interim Phase 1/2 data demonstrated clinical improvements and rapid and sustained lowering of plasma arginine in Arginase 1 Deficiency patients.

About Aeglea BioTherapeutics
Aeglea is a clinical-stage biotechnology company that designs and develops innovative human enzyme therapeutics for patients with rare genetic diseases and cancer. The Company is developing pegzilarginase, its lead investigational therapy, for the treatment of Arginase 1 Deficiency, as monotherapy in arginine-dependent cancers and in combination with an immune checkpoint inhibitor for small cell lung cancer. In addition, Aeglea has an active research pipeline of other human enzyme-based approaches in both therapeutic areas. For more information, please visit http://aegleabio.com.

Safe Harbor / Forward Looking Statements
This press release contains "forward-looking" statements within the meaning of the safe harbor provisions of the U.S. Private Securities Litigation Reform Act of 1995. Forward-looking statements can be identified by words such as: "anticipate," "intend," "plan," "goal," "seek," "believe," "project," "estimate," "expect," "strategy," "future," "likely," "may," "should," "will" and similar references to future periods. These statements are subject to numerous risks and uncertainties that could cause actual results to differ materially from what we expect. Examples of forward-looking statements include, among others, statements we make regarding the timing and success of our clinical trials and related data, the timing of announcements and updates relating to our clinical trials, trial designs and related data, and the potential therapeutic benefits and economic value of our lead product candidate or other product candidates. Further information on potential risk factors that could affect our business and its financial results are detailed in our most recent Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 filed with the Securities and Exchange Commission (SEC), and other reports as filed with the SEC. We undertake no obligation to publicly update any forward-looking statement, whether written or oral, that may be made from time to time, whether as a result of new information, future developments or otherwise.

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Exhibit 99.2

Improvements in Arginase 1 Deficiency Related Disease Manifestations Following Plasma Arginine Reductions With Pegzilarginase

Zori RT[1], Diaz GA[2], Merritt II JL[3], Schulze A[4], Enns GM[5], McNutt MC[6], Teles EL[7], Patki KC[8], Wooldridge JE[8], Batzios SP[9]

Poster #P-164

[1]University of Florida, Gainesville, FL, USA, [2]Icahn School of Medicine at Mt. Sinai, New York City, NY, USA, [3]University of Washington, Seattle, WA, USA[4]University of Toronto and The Hospital for Sick Children, Toronto, ON, Canada, [5]Stanford University, Stanford, CA, [6]UT Southwestern Medical Center, Dallas, TX, USA, [7]Centro Hospitalar de São João, Porto, Portugal, [8]Aeglea BioTherapeutics, Austin, TX, USA, [9]Great Ormond Street Hospital NHS Trust, London, UK

Introduction

ARG1-D autosomal recessive metabolic disease

1. High levels of arginine and arginine-derived metabolites (e.g. GVA, ArgA, NAA, GAA)
2. Impairment of the Urea Cycle (Figure 1)

Key Disease Manifestations

- *Hyperargininemia-related:* spasticity, loss of mobility, developmental delay & seizures
- *Hyperammonemia-related:* food refusal, protein aversion, encephalopathy

Disease Management Approach

- Severe dietary protein restriction
- Ammonia scavengers – control hyperammonemia; reduction of flux through cycle

Figure 1. Metabolic Impact of ARG1-D

Pegzilarginase

- Pegzilarginase is an enhanced recombinant human arginase 1 that enzymatically degrades arginine

Methods

Clinical Studies

1. Phase 1/2 study of IV pegzilarginase in patients with ARG1-D
   - N=12 (7 pediatric, 5 adult) enrolled
   - Part 1: Single ascending doses every 2 weeks
   - Part 2: Repeat doses qw for 8 weeks
2. A Phase 2 open-label long-term extension study

Assessments

- Safety
- Pharmacokinetics
- Pharmacodynamics (plasma arginine and GCs [GVA, ArgA, NAA, GAA])
- Standardized clinical measures (including 6MWT, BBS, GMFM-66, PROMIS)

Results

PATIENT CHARACTERISTICS AND SAFETY

Table 1. Patient Characteristics

Characteristic / Assessment (N=12)	Median (range) Or n (%)	Abnormal Baseline (%)
DISEASE CHARACTERISTICS AND MEDICAL HISTORY		
Age (years)	16.5 (5-31)	
Female	8 (67%)	
History of Spasticity (≥Moderate)	7 (58%)	
History of Seizures	7 (58%)	
History of Hyperammonemia	6 (50%)	
Developmental Delay	8 (67%)	
Ammonia Scavenger	11 (92%)	
BASELINE DISEASE MANIFESTATIONS		
Arginine (μmol/L)	397 (203 to 531)	100%
Baseline ALT (U/L)	37.5 (21 to 171)	58%
Baseline Ammonia (μmol/L)	37 (9 to 77)	50%
Height Centile (CDC)	4.4% (<0.1% to 22.9%)	92%
6MWT (m)	266.5 (102 to 602)	92%
Berg Balance (Score 0-56)	47 (11 to 56)	42%
GMFM Part E (Score 0-72)	48.5 (12 to 72)	67%
PROMIS	38 (28.3 to 57.1)	58%

Table 2. Adverse Event Summary

Patients With	Part 1 (n=12)		Part 2 (n=4)	
Any Related AE	6	(50%)	3	(75%)
Any SAE	3	(25%)	0	
Any Related SAE	2	(17%)	0	

Table 3. ADA

ADA Type	Part 1 Prior to Treatment (n=10)	Part 1 Treatment-Emergent (n=10)	ADA At Start of Part 2 (n=7*)	Titer Range
Anti-PEG	10%	40%	14%	50-800
Anti-pegzilarginase	10%	80%	0	10-160

*One patient with pre-PEG ADA, prior to treatment had developed their during Part 1 and no ADA at final Part 1 dose, but did not continue in Part 2 for unrelated reasons. We patient is not included in the n=7.

Patient Characteristics

- Baseline assessments show a substantial disease burden (Table 1)

Adverse Events

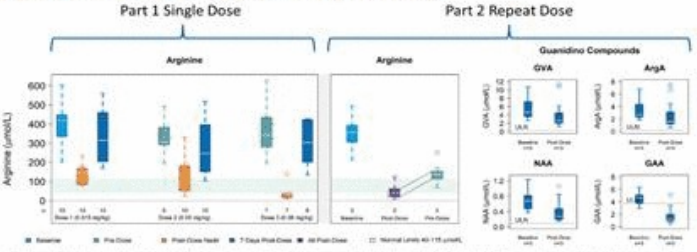
- Most treatment-related AEs (Table 2) were mild
- Treatment-related AEs in ≥2 patients were hypersensitivity (n=3, all moderate), pruritus (n=3, all mild), and dry skin (n=2, both mild)
- >130 infusions administered
  - 4 moderate hypersensitivity reactions in 3 patients (2 considered SAEs)
  - Managed with infusion rate adjustment and antihistamines
- One unrelated SAE of hyperammonemia

ADA

- Transient, low-titer anti-PEG ADAs detected in Part 1 (Table 3)
  - Undetectable ADA at start of Part 2 for 6/7 patients
  - Data suggestive of early tolerization

Results

Figure 2. Effects on Arginine and Guanidino Compounds



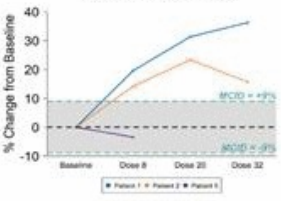
- Pegzilarginase is highly effective at lowering plasma arginine levels, with control into the normal range, with repeat dosing (Figure 2)
- GAA elevated in ARG1-D and lowered by pegzilarginase. GAA has been linked to seizures in GAMT Deficiency (Stockler-Ipsiroglu 2014)

Table 4. Neuromotor Results

Patient Age (years)	Physician/Assessor Observations	Timepoint	6MWT meters	BBS MCID +7	GMFM Part E MCID varies	PROMIS T-Score MCID +5
#1 25	• Improved step quality and confidence while walking • Less resting spasticity than baseline	**Baseline**	**102**	**17 / 56**	**29 / 72**	**35.6**
		Dose 8	+10	+13	+3	-2.3
		Dose 20	+32	+18	+6	
		Dose 32	+37	+11	+7	
					MCID: +1.8	
#2 24	• No meaningful observations documented to date	**Baseline**	**261**	**54 / 56**	**63 / 72**	**40.4**
		Dose 8	+37	+0	+3	+7.6
		Dose 20	+61	−1	+4	
		Dose 32	+41	−1	+4	
					MCID: +4.0	
#5 19	• Improved posture and increased confidence while walking • Noted to be more animated and alert	**Baseline**	**174**	**31 / 56**	**27 / 72**	**36.7**
		Dose 8	-6	−1	+2	+5.1
					MCID: +2.8	

Dose 8, 20, and 32 are from start of repeat dose. PROMIS is specifically the Physical Function Domain of PROMIS. Data in table for 6MWT, BBS, GMFM Part E, and PROMIS are presented as raw value for baseline and change from baseline for other timepoints. MCID for 6MWT is from Schroyer 2017; for BBS is from Downs 2015; for GMFM is from Oeffinger 2008; and for PROMIS Physical Function is 0.5 standard deviations, or 5 points on the T-Score.

Figure 3. 6-Minute Walk Test



- Clinical improvements observed with one or more instruments of neuromotor function in all 3 patients completing 8 weeks of repeat dosing (Table 4)
- Sustained improvement in 6MWT above the MCID for Patients 1 and 2 through Dose 32 (Figure 3)

References [PMIDs] PMIDs:17997338, 22642880, 25125564, 1690873, 15694174, 27038030, 28441951, 23663794, 19046185, 24268530 and De Deyn, P et al., (1997) Guanidino Compounds in Biology & Medicine II.

Support This study was funded by Aeglea BioTherapeutics, Inc.

Disclosures Andreas Schulze and George Diaz are consultants to, and Markey McNutt has received honoraria from, Aeglea BioTherapeutics, Inc.

Kiran Patki and James Wooldridge are employees of, and have an equity interest in Aeglea BioTherapeutics, Inc.

Data cutoff Clinical data received as of 14 August 2018.

Conclusions

- Pegzilarginase resulted in marked reductions in plasma arginine and related guanidino compounds
- Clinical improvements were observed with repeat dose administration of pegzilarginase after 8 weeks
- Pegzilarginase was generally well tolerated; most treatment-related AEs were mild and manageable with standard measures
- Data support continued development of pegzilarginase in ARG1-D

A pivotal study is planned for 2019