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Long-term follow-up of cipaglucosidase alfa/miglustat in ambulatory patients with Pompe disease: an open-label Phase I/II study (ATB200-02)

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INTRODUCTION

- Pompe disease is a rare, multisystemic, heterogenous lysosomal disorder characterised by progressive loss of muscle and respiratory function due to acid α-glucosidase (GAA) deficiency, an enzyme responsible for degrading lysosomal glycogen.[1–3]
- Enzyme replacement therapy (ERT) with recombinant human GAA (rhGAA), alglucosidase alfa, is the first approved treatment for the disease[4]
  - While alglucosidase alfa has been shown to improve prognosis,[5] some patients do not respond and many do not show a sustained benefit;[6] thus, substantial unmet clinical needs remain.[6]
- Another rhGAA, avalglucosidase alfa, was approved in 2021.[7]
- Cipaglucosidase alfa plus miglustat is an investigational, two-component therapy for Pompe disease comprising cipaglucosidase alfa, a novel bis-mannose-6-phosphate-enhanced rhGAA, administered in conjunction with miglustat, an enzyme stabiliser.[8,9]
- Results from the PROPEL study, a 52-week, Phase III study of cipaglucosidase alfa plus miglustat versus alglucosidase alfa plus placebo in patients with Pompe disease were recently published; the open-label extension of this study is ongoing.[9]
- Data from our Phase I/II study (ATB200-02) may provide further understanding of the long-term effect of this investigational therapy.

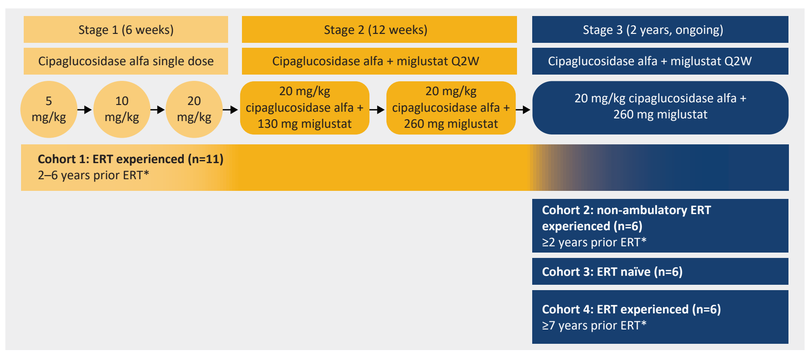
OBJECTIVE

- ATB200-02 (NCT02675465) is an ongoing, open-label, Phase I/II clinical trial that aims to evaluate the safety, tolerability, pharmacokinetics, pharmacodynamics and efficacy of cipaglucosidase alfa plus miglustat in adults with Pompe disease.
- Here, we report up to 48 months of efficacy and safety data for ambulatory patients with Pompe disease in the ATB200-02 study.

METHODS

- The ATB200-02 study is conducted in 17 centres across 6 countries, with 4 cohorts of patients enrolled at staggered timepoints.
- The study design is presented in **Figure 1**.

Figure 1. Phase I/II ATB200-02 study design



*With 20 mg/kg alglucosidase alfa Q2W. Q2W, every 2 weeks.

- A summary of the endpoints and cohorts we report is presented in **Table 1**.
- Available data for cohort 2, non-ambulatory ERT-experienced patients, are presented in the Supplement, which is available via quick response (QR) code.
- Data were analysed using descriptive statistics.

Table 1. Summary of endpoints and cohorts reported

Assessments	ERT experienced*		ERT naïve
	Cohort 1 (2–6 years)	Cohort 4 (≥7 years)	Cohort 3
Motor function 6MWD	Pooled data		✓
Respiratory function FVC	Pooled data		✓
Muscle strength MMT lower extremity score	Pooled data		✓
Biomarkers Hex4 (glycogen accumulation) and CK (muscle damage)	Pooled data		✓
Safety	Pooled data		✓

*With 20 mg/kg alglucosidase alfa Q2W. 6MWD, 6-minute walk distance; CK, creatine kinase; FVC, forced vital capacity; Hex4, glucose tetrasaccharide; MMT, manual muscle test.

RESULTS

Patients

- Baseline characteristics were representative of the Pompe disease population (**Table 2**).
- Due to the staggered timing of patient enrolment, the number of patients with data currently available decreases at later timepoints in this ongoing study.

Table 2. Baseline characteristics and patient disposition

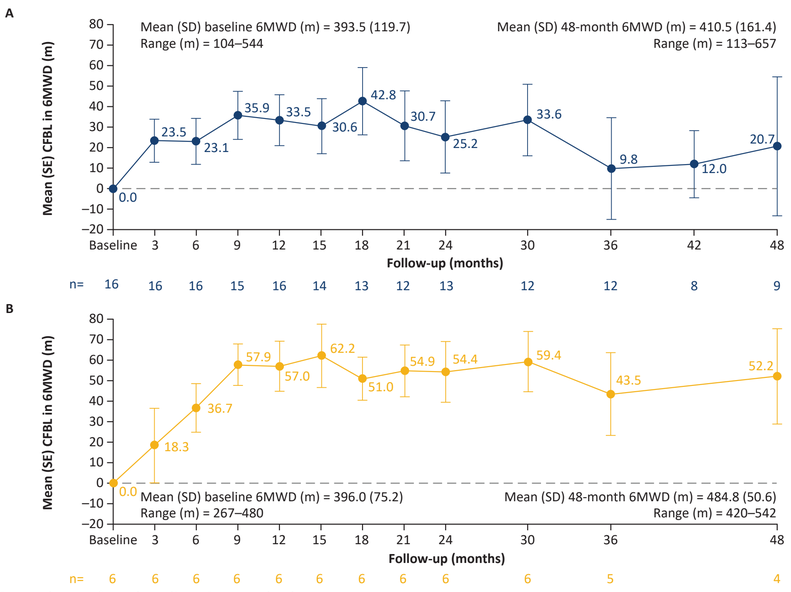
	ERT experienced		ERT naïve
	Cohort 1 2–6 years prior ERT n=11*	Cohort 4 ≥7 years prior ERT n=6	Cohort 3 n=6
Baseline† characteristics			
Median (range) age, years	50.0 (28–66)	43.0 (20–65)	51.0 (24–65)
Sex, M:F	9:2	2:4	1:5
Mean (SD) time on alglucosidase alfa, years	5.1 (1.27)	10.6 (2.06)	N/A‡
Mean (SD) 6MWD, m	397.2 (96.8)	387.3 (161.3)	396.0 (75.2)
Mean (SD) sitting FVC, % predicted	52.6 (13.9)	65.3 (21.1)	57.2 (20.8)
Mean (SD) MMT lower extremity score	31.8 (1.9)	27.3 (3.7)	29.0 (1.7)
Patient disposition			
Ongoing in study, n (%)	9 (82)	6 (100)	6 (100)

*All enrolled patients were included in both the efficacy and safety populations, except one patient in cohort 1 who was excluded from the efficacy population as the patient withdrew consent prior to post-baseline efficacy assessments; †Baseline assessment is the last non-missing result on or prior to the administration of the first dose of study medication (20 mg/kg cipaglucosidase alfa + 260 mg miglustat co-administration dose); ‡1 ERT-naïve patient had received 1 dose of alglucosidase alfa >6 months prior to study entry. m, metres; M:F, male:female; N/A, not applicable; SD, standard deviation.

Motor function

- ERT-experienced cohorts showed durable mean improvements from baseline in 6MWD up to 48 months (**Figure 2A**).
- After 12, 24, 36 and 48 months of follow-up, 6MWD improved numerically from baseline in 13/16, 9/13, 6/12 and 6/9 ERT-experienced patients, respectively.
- The ERT-naïve cohort showed durable mean improvements from baseline in 6MWD up to 48 months (**Figure 2B**).
- After 12, 24, 36 and 48 months of follow-up, 6MWD improved numerically from baseline in 6/6, 6/6, 4/5 and 4/4 ERT-naïve patients, respectively.

Figure 2. CFBL in 6MWD in (A) ERT-experienced and (B) ERT-naïve patients

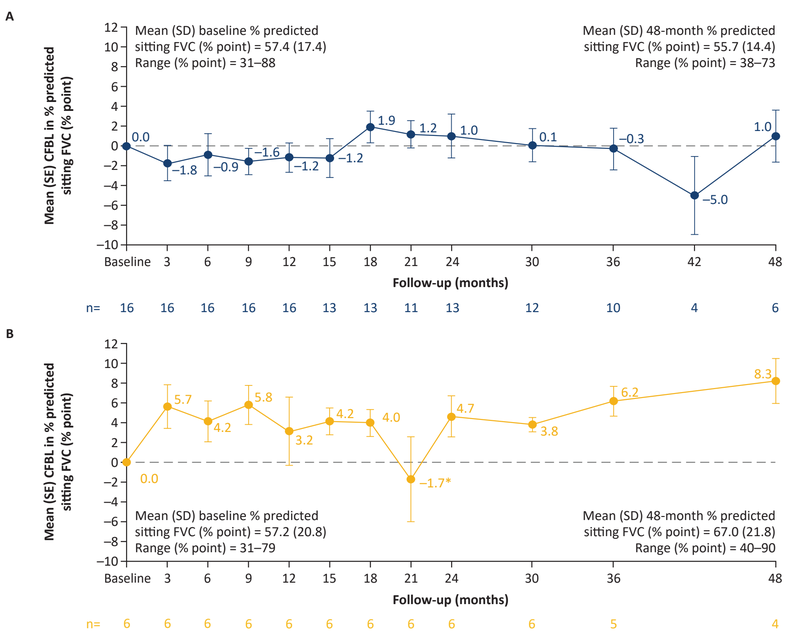


CFBL, change from baseline; SE, standard error.

Respiratory function

- Mean CFBL in FVC was generally stable for up to 48 months of follow-up in ERT-experienced cohorts (**Figure 3A**).
- After 12, 24, 36 and 48 months of follow-up, FVC improved (>3% points) or remained stable (±3% points) from baseline in 9/16, 11/13, 8/10 and 4/6 ERT-experienced patients, respectively.
- Mean CFBL in FVC improved numerically from baseline for up to 48 months of follow-up in the ERT-naïve cohort (**Figure 3B**).
- After 12, 24, 36 and 48 months of follow-up, FVC improved (>3% points) or remained stable (±3% points) from baseline in 5/6, 6/6, 5/5 and 4/4 ERT-naïve patients, respectively.

Figure 3. CFBL in FVC in (A) ERT-experienced and (B) ERT-naïve patients

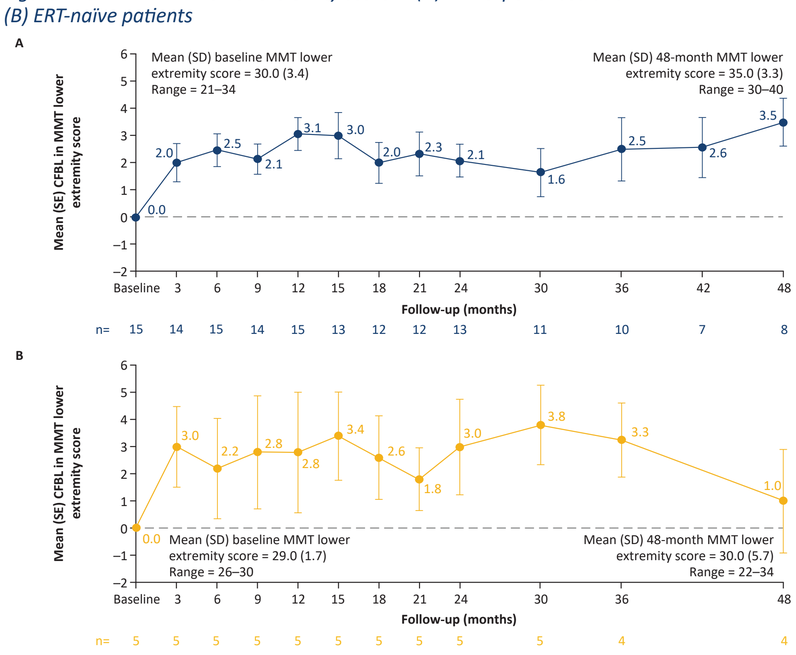


*1 patient in the ERT-naïve cohort experienced a large drop in % predicted FVC at month 21, which returned to previous levels at the following visit (month 24).

Muscle strength

- Mean change in MMT lower extremity score improved numerically from baseline and improvements were generally maintained for up to 48 months of follow-up in both ERT-experienced and ERT-naïve cohorts (**Figures 4A and 4B**).

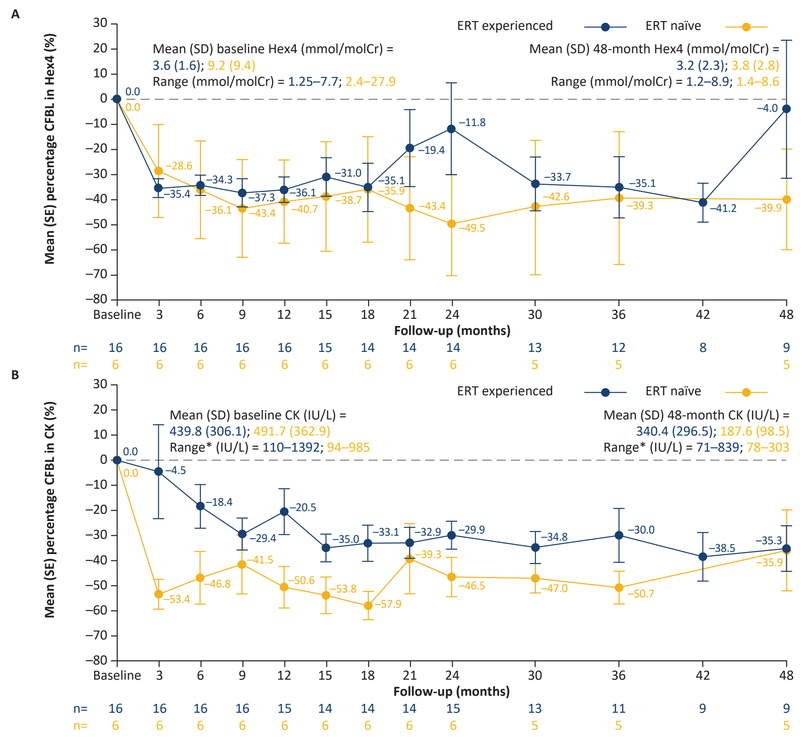
Figure 4. CFBL in MMT lower extremity score in (A) ERT-experienced and (B) ERT-naïve patients



Biomarkers

- During 48 months of follow-up, cipaglucosidase alfa plus miglustat was generally associated with mean reductions from baseline in urine Hex4, with greater reductions in ERT-naïve patients (**Figure 5A**).
- After 12, 24, 36 and 48 months of follow-up, Hex4 levels decreased numerically from baseline in 16/16, 11/14, 11/12 and 6/9 ERT-experienced patients, and in 5/6, 5/6, 4/5 and 4/5 ERT-naïve patients, respectively.
- During 48 months of follow-up, cipaglucosidase alfa plus miglustat was associated with mean reductions from baseline, in plasma CK, with greater reductions in ERT-naïve patients (**Figure 5B**).
- After 12, 24, 36 and 48 months of follow-up, CK levels decreased numerically from baseline in 13/15, 14/15, 9/11 and 8/9 ERT-experienced patients, and in 6/6, 6/6, 5/5 and 4/5 ERT-naïve patients, respectively.

Figure 5. Percentage CFBL in (A) Hex4 and (B) CK levels



*Lower normal CK limit = 26 IU/L. Upper normal CK limit = 192 IU/L.

Safety

- **Table 3** summarises treatment-emergent adverse events (TEAEs).
- Mean (SD) duration of treatment was 51.8 (21.46), 37.7 (4.13) and 54.7 (12.14) months in cohorts 1 (prior ERT 2–6 years), 4 (prior ERT ≥7 years) and 3 (ERT naïve), respectively.
- The most common TEAEs included fall, nasopharyngitis, arthralgia, headache and diarrhoea; the majority of patients experienced only mild or moderate TEAEs that did not lead to study withdrawal.

Table 3. Summary of TEAEs

	ERT experienced n=17	ERT naïve n=6	Overall N=23
TEAEs, n (%)	17 (100)	6 (100)	23 (100)
TEAEs potentially related to treatment	11 (65)	4 (67)	15 (65)
Serious TEAEs	6 (35)	4 (67)	10 (44)
Serious TEAEs potentially related to treatment	1 (6)	2 (33)	3 (13)
TEAEs leading to study withdrawal	1 (6)*	0 (0)	1 (4)
Severe TEAEs	4 (24)	3 (50)	7 (30)
TEAEs leading to death	0 (0)	0 (0)	0 (0)
IARs	8 (47)	3 (50)	11 (48)

TEAEs have an onset date on or after first dose of study drug. *Diffuse large B-cell lymphoma. IAR, infusion-associated reaction.

Limitations

- As might be expected for a Phase I/II study of a rare disease therapy, the sample size was relatively small.
- The heterogenous nature of Pompe disease, spanning a wide spectrum of manifestations, disease severity, rates of progression, and responses to treatment, may have introduced variability into the dataset.
- Data were analysed descriptively, with no statistical comparisons made.

CONCLUSIONS

- Results from up to 48 months of follow-up in ambulatory patients with Pompe disease from the ATB200-02 study of cipaglucosidase alfa plus miglustat showed:
  - ERT-experienced patients had durable mean improvements from baseline in motor function that were sustained for up to 48 months of follow-up, while respiratory function was stable and maintained over the same period: an improvement relative to the expected decline in many patients receiving long-term ERT[6]
  - ERT-naïve patients showed durable mean improvements from baseline in motor and respiratory function that were sustained for up to 48 months of follow-up
  - Mean levels of two biomarkers, Hex4 and CK, were either stable or decreased from baseline up to 48 months of follow-up, with decreases most notable in the ERT-naïve cohort
  - The safety profile of cipaglucosidase alfa plus miglustat was similar to that reported for alglucosidase alfa.[5]

Acknowledgements

The authors thank the patients, their families, and Pompe disease patient organisations, as well as the ATB200-02 study investigators.

This presentation shares information about Amicus Therapeutics' investigational therapy, cipaglucosidase alfa/miglustat, which is in development for the treatment of Pompe disease. This investigational therapy is not approved by any regulatory agency at this time.

Medical writing assistance was provided by Sophie Austin, PhD, at Cence (an AMICULUM® agency) and was funded by Amicus Therapeutics, Inc.

The presenter, Prof. Benedikt Schoser, has received consulting fees from Amicus Therapeutics, Inc., Alexion, Argenx, Avrobio, Maze Therapeutics, Spark Therapeutics and PepGen; has received research grants from Amicus Therapeutics Inc. and Greenovation; has served as an advisory board member for Astellas Therapeutics and Taysha Gene Therapies; has participated in clinical trials within the last 2 years for Amicus Therapeutics Inc., Sanofi Genzyme, Spark Therapeutics and Astellas Therapeutics; and has been a speaker for Kendrion.

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This study was supported by Amicus Therapeutics, Inc.

Presented at the World Muscle Society (WMS) Annual Congress; Halifax, Nova Scotia, Canada; 11–15 October 2022.