# New Results From Landmark NURTURE Study Show That Pre-Symptomatic SMA Patients Treated With SPINRAZA® (nusinersen) Continue to Demonstrate Sustained Benefit From Treatment

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- After up to 4.8 years of continuous treatment with SPINRAZA, 100 percent of children treated pre-symptomatically were alive, and none require permanent ventilation
- Patients continued to maintain and make progressive gains in motor function compared to the natural history of the disease, with 96 percent now able to walk with assistance
- The NURTURE study was recently extended to evaluate the longer-term efficacy and safety of SPINRAZA up to 8 years of age

CAMBRIDGE, Mass., June 10, 2020 (GLOBE NEWSWIRE) -- Biogen Inc. (Nasdaq: BIIB) today announced new results from NURTURE, the longest study of pre-symptomatic patients with spinal muscular atrophy (SMA) that is transforming expectations of early treatment with SPINRAZA (nusinersen). In infants genetically diagnosed with SMA, new data demonstrate that early and sustained treatment with SPINRAZA for up to 4.8 years enabled unprecedented survival. Patients continued to maintain and make progressive gains in motor function compared to the natural course of the disease. These results are being presented at the virtual Cure SMA Research & Clinical Care Meeting taking place June 10-12, 2020.

The new data include nearly a year of additional follow-up for NURTURE study participants. As of February 2020, all patients treated (n=25; median age of 3.8 years old) were alive and remained free of permanent ventilation. In the absence of treatment, the majority of children with SMA Type 1 would, on average, not reach their second birthday. Additionally, all children who achieved the motor milestone of being able to walk independently (many within a normal timeframe) have maintained that ability from the first occurrence until the last visit.

“The impact of early and sustained SPINRAZA treatment on these infants and their families is remarkable. I’ve had the privilege to watch them grow into active young children, many of whom have experienced progress in motor function consistent with children their age who do not have SMA,” said Kathryn Swoboda, M.D., the Katherine B. Sims, M.D., Endowed Chair in Neurogenetics and Director of the Neurogenetics Program, Massachusetts General Hospital. “The new results from NURTURE continue to bolster the substantial benefit of both prompt diagnosis and early and longer-term treatment with SPINRAZA.”

NURTURE is an ongoing, Phase 2, open-label study of 25 pre-symptomatic patients with the genetic diagnosis of SMA (most likely to develop SMA Type 1 or 2) who received their first dose of SPINRAZA before 6 weeks old. The study has been extended by an additional three years, enabling Biogen to evaluate the longer-term efficacy and safety of SPINRAZA through 8 years of age and further understand the impact of early treatment. More information on the NURTURE study (NCT02386553) is available on clinicaltrials.gov.

Additional results from the updated interim analysis as of February 2020 show:

- All study participants who were previously able to walk with assistance (92 percent) and walk independently (88 percent) maintained that ability over the 11 months since the last data cut.[1]
- Over the 11 months of follow-up, one child gained the ability to walk with assistance (increasing to 96 percent of all study participants) and also reached the maximum score on the Children’s Hospital of Philadelphia Infant Test of Neuromuscular Disorders (CHOP-INTEND) scale, increasing the total number of study participants who achieved the maximum score to 21 of 25 (84 percent).
- Patients with two copies of SMN2 were able to score and advance on the Hammersmith Functional Motor Scale Expanded scale (HFMSE), which is atypical to the natural history of the disease.
- SPINRAZA was well-tolerated, with no new safety concerns identified over the extended follow-up period. No children have discontinued the study due to adverse events associated with treatment.

**About SPINRAZA® (nusinersen)[2-4]**
SPINRAZA is the first therapy approved to treat infants, children and adults with spinal muscular atrophy (SMA) and is approved in more than 50 countries. As of March 31, 2020, more than 10,000 individuals have been treated with SPINRAZA. It is the only SMA treatment to combine unsurpassed real-world experience with a robust level of clinical evidence across a broad spectrum of patient populations.

SMA is a rare, genetic, neuromuscular disease that is characterized by a loss of motor neurons in the spinal cord and lower brain stem that can result in severe, progressive muscle atrophy and weakness. Approximately one in 10,000 live births have a diagnosis of SMA, and people of all ages are impacted by the disease. It is a leading genetic cause of infant mortality.

SPINRAZA, a foundation of care in SMA, is an antisense oligonucleotide (ASO), developed using Ionis Pharmaceuticals’ proprietary technology that is designed to target a root cause of SMA by increasing the amount of full-length survival motor neuron (SMN) protein, which is critical to maintaining motor neurons. It is administered by intrathecal injection into the fluid surrounding the spinal cord where motor neurons reside to deliver the treatment where the disease starts.

SPINRAZA currently maintains a robust clinical data set in SMA based on data from approximately 300 patients across a broad range of SMA populations demonstrating a favorable benefit:risk profile. SPINRAZA was evaluated in two randomized, double-blind, sham-controlled studies of infantile and later-onset SMA (ENDEAR and CHERISH, respectively) and supported by open-label studies that include pre-symptomatic infants (NURTURE), individuals with later-onset SMA (CS2/CS12) and an extension study of individuals who previously participated in the clinical development program (SHINE). The most common adverse events observed were respiratory infection, fever, constipation, headache, vomiting and back pain. Hypersensitivity, meningitis and hydrocephalus have been observed in the post-marketing setting. Renal toxicity and coagulation

abnormalities, including acute severe low platelet counts, have been observed after administration of some ASOs. Laboratory tests can monitor for these signs.

Biogen licensed the global rights to develop, manufacture and commercialize SPINRAZA from Ionis Pharmaceuticals, Inc. (Nasdaq: IONS), a leader in antisense therapeutics. Biogen and Ionis conducted an innovative clinical development program that moved SPINRAZA from its first dose in humans in 2011 to its first regulatory approval in five years.

**About Biogen**
At Biogen, our mission is clear: we are pioneers in neuroscience. Biogen discovers, develops and delivers worldwide innovative therapies for people living with serious neurological and neurodegenerative diseases as well as related therapeutic adjacencies. One of the world's first global biotechnology companies, Biogen was founded in 1978 by Charles Weissmann, Heinz Schaller, Kenneth Murray and Nobel Prize winners Walter Gilbert and Phillip Sharp. Today Biogen has the leading portfolio of medicines to treat multiple sclerosis, has introduced the first approved treatment for spinal muscular atrophy, commercializes biosimilars of advanced biologics and is focused on advancing research programs in multiple sclerosis and neuroimmunology, Alzheimer's disease and dementia, neuromuscular disorders, movement disorders, ophthalmology, immunology, neurocognitive disorders, acute neurology and pain.

We routinely post information that may be important to investors on our website at www.biogen.com. To learn more, please visit www.biogen.com and follow us on social media – Twitter, LinkedIn, Facebook, YouTube.

**Biogen Safe Harbor**
This news release contains forward-looking statements, including statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995, about the potential benefits, safety and efficacy of SPINRAZA; the results of certain real-world data; the identification and treatment of SMA; clinical development programs, clinical trials and data readouts and presentations; and the potential benefits and results from early treatment of SMA. These statements may be identified by words such as "aim," "anticipate," "believe," "could," "estimate," "expect," "forecast," "goal," "intend," "may," "plan," "possible," "potential," "will," "would" and other words and terms of similar meaning. You should not place undue reliance on these statements or the scientific data presented.

These statements involve risks and uncertainties that could cause actual results to differ materially from those reflected in such statements, including without limitation the occurrence of adverse safety events; risks of unexpected costs, delays or other unexpected hurdles; failure to protect and enforce our data, intellectual property and other proprietary rights and uncertainties relating to intellectual property claims and challenges; regulatory authorities may require additional information or further studies; failure to obtain regulatory approvals in other jurisdictions; product liability claims; third party collaboration risks; and the direct and indirect impacts of the ongoing COVID-19 pandemic on our business, results of operations and financial condition. The foregoing sets forth many, but not all, of the factors that could cause actual results to differ from our expectations in any forward-looking statement. Investors should consider this cautionary statement, as well as the risk factors identified in our most recent annual or quarterly report and in other reports we have filed with the U.S. Securities and Exchange Commission. These statements are based on our current beliefs and expectations and speak only as of the date of this news release. We do not undertake any obligation to publicly update any forward-looking statements, whether as a result of new information, future developments or otherwise.

*References:*


1. De Vivo DC, Bertini E, Swoboda KJ, et al. Nusinersen initiated in infants during the presymptomatic stage of spinal muscular atrophy: Interim efficacy and safety results from the Phase 2 NURTURE study. *Neuromuscul Disord*. 2019;29(11):842-856. doi:10.1016/j.nmd.2019.09.007.
2. Based on Commercial Patients, Early Access Patients, and Clinical Trial Participants as of March 31, 2020.
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4. Darras B, Markowitz J, Monani U, De Vivo D. Chapter 8 - Spinal Muscular Atrophies. In: Vivo BTD, ed. Neuromuscular Disorders of Infancy, Childhood, and Adolescence (Second Edition). San Diego: Academic Press; 2015:117-145.


*This release was updated on June 16, 2020 to correctly refer to the Children's Hospital of Philadelphia.*


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