LIVMARLI (maralixibat) Presentations Show Improvements in Quality of Life Measures in Alagille Syndrome and PFIC2 at NASPGHAN Annual Meeting 2021

December 13, 2021

- Pruritus response with LIVMARLI treatment is associated with improvements in sleep disturbance in analysis of ICONIC study in Alagille syndrome.

- Serum bile acid response following LIVMARLI treatment in patients with PFIC2 is associated with clinically meaningful improvements in sleep, fatigue and other health-related quality of life symptoms.

FOSTER CITY, Calif.--(BUSINESS WIRE)--Dec. 13, 2021--

Mirum Pharmaceuticals, Inc. (NASDAQ: MIRM) presented new analyses from LIVMARLI™ (maralixibat) oral solution clinical studies during the North American Society for Pediatric Gastroenterology Hepatology and Nutrition Annual Meeting, taking place virtually December 12-18, 2021. These post-hoc analyses assessed the impact of maralixibat treatment response on changes in health-related quality of life (HRQoL) measures among children with Alagille syndrome (ALGS) and progressive familial intrahepatic cholestasis (PFIC) with BSEP deficiency (also known as PFIC2).

Response to treatment with maralixibat in Alagille syndrome is associated with improved health-related quality of life

The analysis evaluated 27 patients with ALGS who received 380 µg/kg per day of LIVMARLI and who remained in the ICONIC study[1] through Week 48, comparing their HRQoL outcomes as reported at baseline and at Week 48. Treatment response to LIVMARLI was defined as a ≥1 point reduction in caregiver Itch-Reported Outcome (ItchRO) instrument score from baseline to Week 48. In addition, the Pediatric Quality of Life (PedsQL) questionnaires (Generic Core PedsQL, Family Impact Scale, and Multidimensional Fatigue Scale) were prospectively collected via a caregiver proxy report and analyzed retrospectively.

At Week 48, 20 patients (74%) met the definition of ItchRO response. Responders showed improved HRQoL measures compared with non-responders:

- Multidimensional Fatigue Total Scale Score from baseline to Week 48 (increase of 13.9 points) more than two times the minimal clinically important difference in responders.
- Six sleep-related items demonstrated significantly larger changes from baseline to Week 48 in responders.
- PedsQL Generic Core Total Scale Score increased on average by 8.8 points, almost two times the minimal clinically important difference in responders.

These data demonstrate that the significant improvements in pruritus seen with LIVMARLI at Week 48 of the ICONIC study are clinically meaningful and are associated with improvements in patients' quality of life.

View the poster in the Publications & Presentations section on Mirum's website.

Maralixibat treatment response is associated with improved health-related quality of life in patients with bile salt export pump deficiency

The analysis examined 22 patients with BSEP deficiency, or PFIC2, following treatment with LIVMARLI as part of the INDIGO study. The dose-escalation study evaluated LIVMARLI at 266 µg/kg per day followed by a long-term stable dosing where patients were allowed to increase to twice-daily dosing from Week 72. The study endpoints were response to treatment with LIVMARLI as defined by a >75% decrease from baseline or reduction below 102 µmol/L in serum bile acid (sBA) at Week 48. HRQoL was assessed using the PedsQL, Family Impact Scale, and Multidimensional Fatigue Scale questionnaires, and all were assessed by caregivers.

Overall, patients with PFIC2 who achieved sBA treatment response at Week 48 experienced clinically meaningful improvements in PedsQL Generic Core Total Scale Score and Multidimensional Fatigue Total Scale Score, as well as statistically significant improvements in sleep and fatigue:

- Responders experienced an improvement from baseline to Week 48 across all HRQoL measures.
- Statistically significant differences were observed between responders versus non-responders as observed in the PedsQL Generic Core Score and Multidimensional Fatigue Scores.
- The change in Family Impact Score from baseline to Week 48 for responders was clinically meaningful (>1.5 times the MCID), but the difference between responders and non-responders was not statistically significant.
- Responders experienced a change of ≥5 points in the PedsQL Generic Core Total Scale Score compared with non-responders.
- A ≥10-point change in PedsQL Multidimensional Fatigue Total Scale Score was experienced by all responders (100%) and two non-responders (16.7%).

View the poster in the Publications & Presentations section on Mirum's website.

"These analyses help to further our understanding of LIVMARLI's potential to provide a meaningful impact on quality of life measures for Alagille

syndrome patients who achieve pruritus response and for PFIC2 patients who achieve serum bile acid reduction following treatment," said Dr. Pam Vig, head of research and development at Mirum. "Patients often suffer greatly due to lack of sleep caused by severe and unrelenting pruritus, and these data help elucidate the correlation between pruritus response and improvements in quality of life outcomes."

Also during NASPGHAN, Mirum featured three encore poster presentations:

- Abstract #304: Pruritus intensity is associated with cholestasis biomarkers and quality of life measures after maralixibat treatment in children with Alagille syndrome
- Abstract #548: An integrated analysis of long-term clinical safety in maralixibat-treated participants with Alagille syndrome
- Abstract #549: Gastrointestinal tolerability of maralixibat in patients with Alagille syndrome: An integrated analysis of short- and long-term treatment

About LIVMARLI™ (maralixibat) oral solution

LIVMARLI™ (maralixibat) oral solution is an orally administered, once-daily, ileal bile acid transporter (IBAT) inhibitor approved by the U.S. Food and Drug Administration for the treatment of cholestatic pruritus in patients with Alagille syndrome (ALGS) one year of age and older and is the only FDA-approved medication to treat cholestatic pruritus associated with Alagille syndrome. For more information, please visit LIVMARLI.com.

LIVMARLI is currently being evaluated in late-stage clinical studies in other rare cholestatic liver diseases including progressive familial intrahepatic cholestasis (PFIC) and biliary atresia. LIVMARLI has received Breakthrough Therapy designation for ALGS and PFIC type 2 and orphan designation for ALGS, PFIC and biliary atresia. To learn more about ongoing clinical trials with LIVMARLI, please visit Mirum's clinical trials section on the company's website.

IMPORTANT SAFETY INFORMATION

LIVMARLI can cause serious side effects, including:

Changes in liver tests. Changes in certain liver tests are common in patients with Alagille syndrome and can worsen during treatment with LIVMARLI. These changes may be a sign of liver injury and can be serious. Your healthcare provider should do blood tests before starting and during treatment to check your liver function. Tell your healthcare provider right away if you get any signs or symptoms of liver problems, including nausea or vomiting, skin or the white part of the eye turns yellow, dark or brown urine, pain on the right side of the stomach (abdomen) or loss of appetite.

Stomach and intestinal (gastrointestinal) problems. LIVMARLI can cause stomach and intestinal problems, including diarrhea, stomach pain, and vomiting during treatment. Tell your healthcare provider right away if you have any of these symptoms more often or more severely than normal for you.

A condition called **Fat Soluble Vitamin (FSV) Deficiency** caused by low levels of certain vitamins (vitamin A, D, E, and K) stored in body fat. FSV deficiency is common in patients with Alagille syndrome but may worsen during treatment. Your healthcare provider should do blood tests before starting and during treatment.

Other common side effects reported during treatment were bone fractures and gastrointestinal bleeding.

Prescribing information

About Mirum Pharmaceuticals, Inc.

Mirum Pharmaceuticals, Inc. is a biopharmaceutical company dedicated to transforming the treatment of rare liver diseases. Mirum's approved medication is LIVMARLI™ (maralixibat) oral solution which is approved in the U.S. for the treatment of cholestatic pruritus in patients with Alagille syndrome one year of age and older.

Mirum's late-stage pipeline includes two investigational treatments for debilitating liver diseases affecting children and adults. Maralixibat (LIVMARLI), an oral ileal bile acid transporter (IBAT) inhibitor, is currently being evaluated in clinical trials for pediatric liver diseases and includes the MARCH Phase 3 study for progressive familial intrahepatic cholestasis (PFIC) and the EMBARK Phase 2b study for patients with biliary atresia. In addition, Mirum has an expanded access program open in Canada, Australia, the UK and several countries in Europe for eligible patients with Alagille syndrome.

Mirum has submitted a Marketing Authorization Application to the European Medicines Agency for maralixibat for the treatment of cholestatic liver disease in patients with Alagille syndrome.

Mirum's second investigational treatment, volixibat, also an oral IBAT inhibitor, is being evaluated in three potentially registrational studies including the OHANA Phase 2b study for pregnant women with intrahepatic cholestasis of pregnancy, VISTAS Phase 2b study for adults with primary sclerosing cholangitis, and the VANTAGE Phase 2b study for primary biliary cholangitis.

To augment its pipeline in cholestatic liver disease, Mirum has acquired the exclusive option to develop and commercialize gene therapy programs VTX-803 and VTX-802 for PFIC3 and PFIC2, respectively, from Vivet Therapeutics SAS, following preclinical evaluation and investigational new drug-enabling studies.

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Forward-Looking Statements

This press release includes forward-looking statements pertaining to the Company's planned participation at a scientific conference, which may include discussion of the Company's clinical and research data, including the discovery, development and commercialization of our product candidates and technologies, and the therapeutic potential thereof, the continuation of our clinical trials, and the success of our collaborations with partners and any potential future collaborations. Such forward-looking statements are subject to risks and uncertainties that could cause actual results to differ

materially from those expressed or implied in such statements. Applicable risks and uncertainties include those relating to our preclinical research and clinical programs and other risks identified under the heading “Risk Factors” included in our most recent Form 10-Q and Form 10-K filings and in other future filings with the SEC. The forward-looking statements contained in this press release reflect Mirum's current views with respect to future events, and Mirum does not undertake and specifically disclaims any obligation to update any forward-looking statements.

[1]Gonzales E, et al. *The Lancet*. 2021;398:1581-1592

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