X4 Presents Data from Ongoing Phase 2 Study Demonstrating Promising Activity of X4P-001-RD in Patients with WHIM Syndrome

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Dose dependent increases in absolute neutrophil and lymphocyte counts observed in all patients treated with X4P-001-RD

X4P-001-RD was well tolerated and a recommended dose of future Phase 3 study has been established

Interim report from the Phase 2 study presented at the 23rd European Hematology Association Congress

CAMBRIDGE, MA – June 15, 2018 – X4 Pharmaceuticals, a clinical stage biotechnology company developing novel CXCR4 allosteric antagonist drugs to improve immune cell trafficking to treat cancer and rare disease, today announced the presentation of clinical data demonstrating safety and promising activity of X4P-001-RD in patients with WHIM syndrome, a rare primary immunodeficiency disease. The X4P-001-RD clinical data is from the ongoing open-label Phase 2 portion of a Phase 2/3 study in patients with WHIM syndrome, and the presentation was made at the 23rd Congress of the European Hematology Association (EHA) taking place on June 14-17, 2018 in Stockholm, Sweden.

The interim results from the Phase 2 portion of the study demonstrated promising activity of X4P-001-RD with dose-dependent increases in absolute neutrophil and lymphocyte counts in patients with WHIM syndrome. Most patients enrolled in the study to date had meaningful increases in the levels of neutrophil and lymphocyte counts with daily oral administration of X4P-001-RD. Measurement of circulating neutrophils and lymphocytes are endpoints in the X4P-001-RD clinical study because in WHIM syndrome patients, leukocytes are retained in the patient's bone marrow, causing severe chronic panleukopenia, including neutropenia and lymphopenia. This results in inadequate immune surveillance and function for WHIM syndrome patients.

X4P-001-RD was observed to be safe and well tolerated for durations up to 400 days and including doses up to 400 mg daily. Based on this safety profile, along with results of dose-dependent neutrophil and lymphocyte activity, the recommended dose of X4P-001-RD in the future Phase 3 study has been determined to be 400 mg once daily. X4 is completing the Phase 2 portion and plans to initiate the Phase 3 portion towards year end.

"In this study, X4P-001-RD showed consistent increases in neutrophils and lymphocytes, the primary biomarker for response to therapy. Increases in these biomarkers are an indication of an improvement in the pathophysiology underlying WHIM syndrome. One exciting example of improvement was a reduction in HPV-related warts following X4P-001-RD therapy in one patient," said David C. Dale, MD, Professor of Medicine at the University of Washington, Seattle, WA and lead investigator of the study. "These results are very encouraging and represent a milestone in X4P-001-RD's development as an oral therapy for WHIM syndrome patients."

The poster presentation at EHA describes results from the first 8 patients with genetically confirmed WHIM syndrome who were enrolled in the Phase 2 portion of the ongoing Phase 2/3 study (as of data cutoff date of March 20, 2018) and include the following highlights:

- All patients demonstrated a dose-dependent increase in neutrophils and lymphocytes from screening values.
- X4P-001-RD drug exposure showed a dose-dependent increase that correlated with increases in absolute neutrophil count.
- X4P-001-RD was observed to be well tolerated for durations up to 400 days and up to doses including 400 mg daily, with no serious adverse events (AEs) observed.
- Preliminary evidence of clinical activity in the form of improvement in warts in one patient has been observed.

"Our clinical program with X4P-001-RD in WHIM syndrome has made significant progress, with the establishment of the recommended dose for our future Phase 3 study in WHIM syndrome," said Sudha Parasuraman, MD, Chief Medical Officer of X4. "We look forward to moving expeditiously toward starting the pivotal Phase 3 study."

Details of the trial of X4P-001-RD in patients with WHIM syndrome can be found on clinicaltrials.gov: https://clinicaltrials.gov/ct2/show/NCT03005327.

About WHIM Syndrome

WHIM syndrome is a primary immunodeficiency disease caused by a mutation in the C-X-C receptor type 4 (CXCR4) gene resulting in susceptibility to certain types of infections. WHIM is an abbreviation for the characteristic clinical symptoms of the syndrome: Warts, Hypogammaglobulinemia, Infections, and Myelokathexis. Within the overall category of primary immunodeficiencies, there are between 15,000 and 100,000 patients in the US that are classified with primary immunodeficiency disease of unknown origin – of which WHIM is one.[1,2,3] WHIM syndrome is a rare disorder and the precise prevalence or incidence of patients that have the genetic mutation responsible for WHIM syndrome is unknown. Because patients are highly susceptible to infections, WHIM syndrome is associated with significant morbidity beginning in early childhood and continuing throughout life. Current therapy is limited to treatment of acute infections with antibiotics or prevention through the use of intravenous immunoglobulin or G-CSF. There is no approved therapy for the treatment of WHIM syndrome.

About X4P-001-RD for Primary Immunodeficiency Disease

X4P-001-RD, an oral, small molecule inhibitor of CXCR4 is being developed for use as a life-long treatment for patients with WHIM syndrome and other primary genetic immunodeficiencies. X4P-001-RD is currently being studied in a Phase 2/3 trial in patients with WHIM syndrome. Within the bone marrow, a normally functioning CXCR4 receptor controls the release of neutrophils and leukocytes into the blood stream, thereby ensuring normal immune surveillance functions throughout the body. In patients with WHIM syndrome, mutations to the CXCR4 gene cause aberrant signaling leading to retention of neutrophils and leukocytes in the bone marrow and inadequate immune surveillance and function.[4,5] X4P-001-RD is designed to normalize the signaling for the mutant CXCR4 receptor to promote the release of neutrophils and leukocytes, thereby restoring healthy immunity.

About X4 Pharmaceuticals

X4 Pharmaceuticals is developing novel therapeutics designed to improve immune cell trafficking to treat cancer and rare diseases. The Company's oral small molecule drug candidates antagonize the CXCR4 pathway, which plays a central role in immune surveillance. X4's most advanced product candidate, X4P-001-RD, is in a Phase 2/3 study in patients with WHIM syndrome, a rare genetic, primary immunodeficiency disease. X4P-001-IO is currently under investigation in multiple clinical studies in solid tumors. X4 was founded and is led by a team with deep product development and commercialization expertise, including several former members of the Genzyme leadership team, and is located in Cambridge, MA. For more information, visit x4.theyatesnetwork.com.

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