Sangamo Therapeutics Logo

Sangamo BioSciences Announces FDA Clearance Of Investigational New Drug Application For SB-FIX, First In Vivo Protein Replacement Platform Program For Treatment Of Hemophilia B

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Study, Scheduled to Begin in 2016, Will Represent First Clinical Application of In Vivo Genome Editing

RICHMOND, Calif., Dec. 1, 2015 /PRNewswire/ -- Sangamo BioSciences, Inc. (NASDAQ: SGMO), the leader in therapeutic genome editing, announced that the U.S. Food and Drug Administration (FDA) has cleared the Company's Investigational New Drug (IND) application for SB-FIX, a potentially curative, single treatment therapy for hemophilia B. SB-FIX is the first *in vivo* genome editing application to enter the clinic and is based on Sangamo's proprietary In Vivo Protein Replacement Platform™ (IVPRP™). The IND is now active and enables Sangamo to initiate a Phase 1/2 clinical study (SB-FIX-1501) designed to assess safety, tolerability and potential efficacy of SB-FIX in adults with hemophilia B.

"We are very pleased to be in a position to initiate a clinical trial of our hemophilia B program which will not only be the first clinical application of our IVPRP but the first human study of any *in vivo* genome editing application," said Edward Lanphier, Sangamo's president and chief executive officer. "The FDA's determination that our planned clinical trial may proceed is not only an important milestone for Sangamo's hemophilia program, but is a major de-risking event for our entire IVPRP as we are able to leverage this same approach to develop ZFP Therapeutics® for hemophilia A and numerous lysosomal storage disorders (LSDs). This is a significant achievement for the fields of genome editing and gene therapy, and marks a new era in genetic medicine."

"A single treatment with SB-FIX has the potential to provide life-long, stable expression of clinically relevant levels of Factor IX (FIX) protein and eliminate patients' need for chronic transfusions of recombinant clotting factor," said Geoff Nichol, M.B., Ch.B., Sangamo's executive vice president of research and development. "Our proprietary IVPRP genome editing approach allows us to precisely target and edit the albumin "safe harbor" locus in the DNA of liver cells which we expect to result in therapeutic levels of clotting factor that are maintained for the life of the patient. In contrast, conventional AAV gene therapy approaches, which are non-integrating, have the potential to "wash out" over time as the patient's liver cells divide and turn over. Ultimately, our target population for this approach will be young children with hemophilia B who will benefit most from a permanent treatment."

SB-FIX-1501 is a Phase 1/2 open-label, dose-escalation study in male subjects over eighteen years of age, with severe hemophilia B, who do not have inhibitors to FIX and have no hypersensitivity to recombinant Factor IX (rFIX) protein. The study, which will begin enrolling up to nine subjects in 2016, will evaluate the safety and efficacy of a single administration of SB-FIX. The principal investigators are Nadia Ewing, M.D., Director, Comprehensive Hemophilia Treatment Center and Sickle Cell Program, and John Zaia, M.D., Director, Center for Gene Therapy at City of Hope in Duarte, California. The ZFP Therapeutic includes the therapeutic FIX replacement gene and zinc finger nucleases (ZFNs) formulated as adeno-associated virus (AAV) vector preparations and will be administered as a single intravenous dose.

Sangamo remains on track to file an IND for MPS I (Hurler syndrome), the first of the Company's LSD programs employing its IVPRP approach, by the end of 2015, and an IND application for MPS II (Hunter syndrome) in the first half of 2016. The Company also expects to file three more IND applications in the second half of 2016 for hemophilia A, Gaucher disease, and one other LSD target.

About Sangamo's IVPRP
The IVPRP approach makes use of the albumin gene locus, a highly expressing and liver-specific genomic "safe-harbor site," that can be edited with zinc finger nucleases (ZFNs) to accept and express any therapeutic gene. The platform is designed to enable the patient's liver to permanently produce circulating therapeutic levels of a corrective protein product such as Factor VIII or IX to treat hemophilia, or replacement enzymes to treat lysosomal storage disorders. The ability to permanently integrate the therapeutic gene in a highly specific targeted fashion significantly differentiates Sangamo's IVPRP approach from conventional AAV gene therapy approaches, which are non-integrating, and may "wash out" of the liver as cells divide and turn over. Ultimately, the target population for IVPRP programs will be pediatric patients and it will be important in this population to be able to produce stable levels of therapeutic protein for the lifetime of the patient. With such a large capacity for protein production (approximately 15g/day of albumin), targeting and co-opting only a very small percentage of the albumin gene's capacity is sufficient to produce the needed replacement protein at therapeutically relevant levels with no significant effect on albumin production.

About Hemophilia B
Hemophilia, a rare bleeding disorder in which the blood does not clot normally, is caused by mutations in genes that encode factors which help the blood clot and stop bleeding when blood vessels are injured. Hemophilia B is caused by a defect in the gene encoding clotting Factor IX protein and individuals with this mutation experience bleeding episodes after injuries and spontaneous bleeding episodes that often lead to joint disease such as arthritis. According to the National Hemophilia Foundation and the World Federation of Hemophilia, hemophilia B occurs in about one in every 25,000 male births with approximately 4,000 males currently affected. The standard treatment for individuals with hemophilia is protein replacement of the defective clotting factor with regular infusion of recombinant clotting factors or plasma concentrates. These therapies are expensive and sometimes stimulate the body to produce antibodies against the factors that inhibit the benefits of treatment. The most severe forms of hemophilia B require the need for ongoing, preventive infusions.

About Sangamo
Sangamo BioSciences, Inc. is focused on Engineering Genetic Cures™ for monogenic and infectious diseases by deploying its novel DNA-binding

protein technology platform in therapeutic genome editing and gene regulation. The Company has a Phase 2 clinical program to evaluate the safety and efficacy of novel ZFP Therapeutics® for the treatment of HIV/AIDS (SB-728). Sangamo's other therapeutic programs are focused on monogenic and rare diseases. The Company has formed a strategic collaboration with Biogen Inc. for hemoglobinopathies, such as sickle cell disease and beta-thalassemia, and with Shire International GmbH to develop therapeutics for Huntington's disease. It has also established strategic partnerships with companies in non-therapeutic applications of its technology, including Dow AgroSciences and Sigma-Aldrich Corporation. For more information about Sangamo, visit the Company's website at www.sangamo.com.

ZFP Therapeutic® is a registered trademark of Sangamo BioSciences, Inc.

This press release may contain forward-looking statements based on Sangamo's current expectations. These forward-looking statements include, without limitation, references relating to research and development of novel ZFP TFs and ZFNs and therapeutic applications of Sangamo's ZFP technology platform, the potential of Sangamo's ZFP technology to treat hemophilia B, hemophilia A and lysosomal storage disorders, including MPS I, MPS II, Gaucher disease, the expected timing of trial enrollment for SB-FIX-1501 and filing of IND applications for hemophilia A, MPS I MPS II and Gaucher disease, the impact of the SB-FIX clinical trial on the field of genetic medicine, and the safety and efficacy of the approach of using ZFN-mediated genome editing. Actual results may differ materially from these forward-looking statements due to a number of factors, including uncertainties relating to the initiation and completion of stages of our clinical trials, whether the clinical trials will validate and support the safety, tolerability and efficacy of ZFNs and ZFP TFs, technological challenges, Sangamo's ability to develop commercially viable products and technological developments by our competitors. For a more detailed discussion of these and other risks, please see Sangamo's public filings with the Securities and Exchange Commission, including the risk factors described in its Annual Report on Form 10-K and its most recent Quarterly Report on Form 10-Q. Sangamo assumes no obligation to update the forward-looking information contained in this press release.

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