# Sangamo BioSciences Provides Clinical Update On SB-728-T Program and Developments In Other ZFP Therapeutic Programs at American Society of Gene and Cell Therapy Annual Meeting

May 14, 2015

**Data from Sangamo's SB-728-T Program for HIV/AIDS Featured in 'Clinical Trials Spotlight'**

**Additional Presentations Feature New Data Demonstrating Novel ZFN-mediated Genome Editing Approaches for Beta-thalassemia, and PD-1 Knockout to Improve Adoptive T-cell Cancer Immunotherapy**

RICHMOND, Calif., May 14, 2015 /PRNewswire/ -- Sangamo BioSciences, Inc. (Nasdaq: SGMO) announced that clinical and preclinical data from several ZFP Therapeutic® programs and collaborations were presented in the first two days of the 18th Annual Meeting of the American Society of Gene and Cell Therapy (ASGCT). The meeting is being held in New Orleans, LA, from May 13-16, 2015.

"As the largest gene and cell therapy conference in the world, this is a key meeting at which to highlight the power and breadth of therapeutic applications of our ZFP technology," stated Edward Lanphier, Sangamo's president and CEO. "This year we are presenting data supporting an important new development in our approach to hemoglobinopathies, which we are undertaking in collaboration with Biogen, as well as data from research collaborations in cancer immunotherapy that demonstrate the ability of our highly specific ZFN genome editing technology to potentially improve the novel use of T-cell therapies for oncology. We are also providing an update on viral load control in subjects in our HIV clinical program which is now in Phase 2 clinical studies. In addition, Sangamo's abstract describing clinical data on HIV reservoir reduction was one of six presentations selected for the Clinical Trials Spotlight Session."

In summary, data were presented demonstrating:

**New and Ongoing Clinical Evidence of Viral Control in HIV/AIDS**

Two presentations featured clinical data from two trials of the Company's ZFP Therapeutic, SB-728-T, which is being developed as a potential 'functional cure' for HIV/AIDS. The studies demonstrated the effect of SB-728-T treatment on both viral load control and HIV reservoir reduction in HIV-infected subjects.

The first, *"Adoptive Transfer of ZFN Mediated CCR5 Modified CD4 T-cells (SB-728-T) in HIV Subjects Leads to Long Term Engraftment of HIV Resistant T Memory Stem Cells and Decrease in Size of Latent Reservoir"* (Abstract #C-7*),* was featured in this morning's Clinical Trials Spotlight session.

The presentation summarized further analysis of data from nine HIV-infected subjects, with sub-optimal T-cell levels and no detectable viral load on long-term ART, so-called immunologic non-responders (INRs) who were enrolled in an open-label Phase 1 clinical trial (SB-728-902 Cohorts 1-3). Clinicians observed long-term immune reconstitution of CD4 T-cells for the entire follow-up period (up to 3 years post treatment) at levels, and for periods, not seen in other HIV/T-cell trials, which was positively correlated beyond 12 months with the presence of an important T Memory Stem Cell CD4 subset ($T_{SCM}$) (r=0.7904, p=0.0279 at 3 years). The $T_{SCM}$ population had the highest levels of ZFN modification and showed evidence of differentiation into other T-cell types. Measures of circulating $T_{SCM}$ also correlated with the decay of the HIV reservoir which was observed in all subjects, with a statistically significant regression slope ($R^2$ = 0.526, p = 0.042). The data suggest that expansion (and potentially differentiation) of CCR5 modified $T_{SCM}$ may provide a long term source of protected T-cells resulting in a reduction in the HIV reservoir.

In a second presentation entitled, *"A Dose Escalation Study of Cyclophosphamide (CTX) to Enhance SB-728-T Engraftment"* (Abstract #25), Dale Ando, M.D., Sangamo's vice president of therapeutic development and chief medical officer, reported on updated data demonstrating viral load (VL) control from three subjects treated in Cohort 3* of the Company's SB-728-1101 clinical trial. After preconditioning with an optimal dose of Cytoxan (1.0 g/$m^2$) to enhance modified cell engraftment, the subjects received a T-cell product containing both CCR5 modified CD4 and CD8 T-cells. Six weeks post-treatment all three underwent a treatment interruption (TI) from their antiretroviral medication. Two of the three have demonstrated significant control of viral load, one to levels that are quantifiable but considered to render the subject non-infectious and one who demonstrated a one log drop from peak VL after a delayed onset of viremia. Both remain on TI. An additional five subjects will be accrued into this cohort to further evaluate the inclusion of ZFN-modified CD8 T-cells in the cell product. Two additional SB-728-T treated subjects continue to demonstrate VL control without ART, one in the 1101 trial (Cohort 5) for approximately nine months and one subject from the SB-728-902 Cohort 5 for more than18 months.

**Erythroid-specific BCL11A Modulation for Beta-thalassemia and Sickle Cell Disease (SCD)**

In a presentation titled, "*From GWAS to the Clinic: Genome-Editing the Human Bcl11a Erythroid Enhancer for Fetal Globin Elevation in the Hemoglobinopathies" (*Abstract #53*)*, new data were described demonstrating the effectiveness of knocking out the BCL11A Enhancer in hematopoietic stem and progenitor cells (HPSCs) as an approach to elevate fetal globin in a manner that is specific for red blood cell precursors (erythroid-specific), thereby eliminating any effect of reduced BCL11A expression in HSPCs or other non-erythroid lineages. Sangamo recently

announced that based on these data, a decision had been made by the Sangamo-Biogen joint steering committee governing the hemoglobinopathies programs, to use this approach to develop a potentially one-time long-lasting treatment for both beta-thalassemia and SCD.

**PD-1 Knockout to Improve Adoptive T-cell Cancer Immunotherapy**

Data were also presented demonstrating the successful incorporation of ZFN-mediated genome editing into an existing clinical scale production method to improve the anti-tumor activity of a tumor infiltrating lymphocyte (TIL)-based therapeutic for melanoma. The ZFNs were designed to knock out the gene for PD-1, a validated "checkpoint inhibitor" with established and marked clinical efficacy in a range of tumor types, whose expression on the cell surface decreases the activity of tumor targeted immune cells. The data demonstrated that the ZFN-mediated genome editing process was robust and very efficient with up to 84% of total alleles modified, leading to significant reduction of PD-1 expression and improved in vitro reactivity against tumor cells. This work was carried out in collaboration with members of the laboratory of Dr. Steven Rosenberg at the National Cancer Institute (*"Clinical scale zinc finger nuclease (ZFN)-driven gene-editing of PD-1 in Tumor Infiltrating Lymphocytes (TIL) for the potential treatment of metastatic melanoma" [*Abstract# 77*]).*

**About SB-728-T**

Sangamo's drug, SB-728-T, is generated by ZFN-mediated modification of the gene encoding CCR5 in a patient's own T-cells. ZFN modification disrupts the expression of this key co-receptor for HIV entry and renders cells resistant to HIV infection. The approach is based on the observation that a naturally occurring mutation in the CCR5 gene, CCR5 delta-32, provides protection from HIV infection. Individuals in whom both copies of the CCR5 gene carry the delta-32 mutation are generally not susceptible to the most common strain of HIV.

**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 gene regulation and genome editing. 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 Shire International GmbH to develop therapeutics for hemophilia, Huntington's disease and other monogenic diseases, and with Biogen Inc. for hemoglobinopathies, such as sickle cell disease and beta-thalassemia. 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, the research and development of novel ZFP TFs and ZFNs as ZFP Therapeutics and therapeutic applications and the scope of such applications of Sangamo's ZFP technology platform to specific human diseases and unmet medical needs, including a potential functional cure of HIV/AIDS, the expansion and expected timing of clinical studies of SB-728-T in HIV-infected individuals, the development of ZFP Therapeutics for monogenic diseases such as beta-thalassemia and sickle cell disease, adoptive T-cell therapies for cancer and stem cell applications. Actual results may differ materially from these forward-looking statements due to a number of factors, including uncertainties relating to whether clinical trials will validate and support tolerability and efficacy of ZFP Therapeutic approaches, technological challenges, Sangamo's ability to develop commercially viable products and technological developments by our competitors. See Sangamo's SEC filings, and in particular, the risk factors described in the Company's Annual Report on Form 10-K and 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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Released May 14, 2015