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# Data to Be Published in the Journal of Immunology Research Support Phosphatidylserine (PS) as a Potential Target in Ebola Infection

## Peer-Reviewed Data Show Peregrine Pharmaceuticals' PS-Targeting Antibody Bavituximab Exhibits Specific and Strong Binding to Ebola Virions and Ebola Virus-Infected Cells In Vitro; Data Supplement Published Scientific Literature Suggesting the Important Role of PS in Ebola Infection in Viral Entry and Immune Suppression During Infection

TUSTIN, CA -- (Marketwired) -- 10/15/14 -- Peregrine Pharmaceuticals, Inc. (NASDAQ: PPHM) (NASDAQ: PPHMP), today announced the publication of a peer-reviewed manuscript related to preclinical research demonstrating that the company's lead drug candidate bavituximab, a phosphatidylserine (PS)-targeting antibody, exhibits specific and strong binding to Ebola virions and Ebola virus (EBOV)-infected cells *in vitro*. These results will appear in the Vaccines and Therapies for Biodefense Agents special edition of the peer-reviewed *Journal of Immunology Research* in a manuscript titled: "Effective Binding of a Phosphatidylserine-Targeting Antibody to Ebola Virus Infected Cells and Purified Virions."

"The recent outbreaks of Ebola infections highlight the need for novel clinical treatments and new combinations that are effective in treating the disease. We have a number of active collaborations exploring the potential of PS-targeting antibodies in infectious diseases and the results just published, along with a growing body of scientific literature, support potential applications of our PS-targeting platform in virus infections including Ebola," said Jeff T. Hutchins, Ph.D. vice president, preclinical research at Peregrine Pharmaceuticals. "Evolution has favored pathogenesis that exposes PS and these published results, along with other recently to be published data, have shown that PS is present during Ebola virus infection[1-3] and is important in the infection process. While our primary focus remains on advancing bavituximab in oncology, including our SUNRISE Phase III lung cancer trial, we believe these data warrant further collaborative investigation in Ebola and other infectious diseases including combinations with vaccines and active therapies that have shown promise."

The manuscript details the results from a study demonstrating that exposed PS allows for the specific binding of bavituximab to purified Ebola virions and EBOV-infected cells *in vitro*. Previous published studies have shown that surface exposure of PS antigen is a consequence of viral infection. Published results in other lethal viral hemorrhagic fever animal model (Pichinde virus infection model in guinea pigs)[5] suggest that PS-targeting antibodies can bind to exposed PS and limit viral infection by initiating the removal of virions from the bloodstream through the induction of antibody-dependent cellular cytotoxicity (ADCC) as well as eliminate virus-infected cells.

"Our goal with this work was to continue exploring the potential of bavituximab in the antiviral arena and in this case, specifically in biodefense applications," said Cyril Empig, Ph.D., associate research director at Peregrine Pharmaceuticals. "With the increased focus on Ebola, there is an opportunity to take advantage of the specificity of bavituximab for Ebola virus and develop therapeutics or treatment regimens that could neutralize the virus. In addition, recently reported genomic sequence variations in EBOV suggest that drugs targeting specific viral non-variant proteins or protein sequences are at risk of failure as a result of virus escape mutations.[4] We believe that there are advantages to utilizing bavituximab in a treatment regimen against Ebola virus given its great specificity for Ebola virions and Ebola-infected cells, its potential to circumvent the problem of virus escape mutations given that it is targeting a host molecule rather than a virus protein or protein sequence, and the possible role of PS in immunosuppression during Ebola infection.[1] Given these data, we are developing a plan to explore potential applications of bavituximab and PS-targeting antibodies in the treatment of Ebola."

A link to the provisional manuscript can be found on the front page of the company's website at www.peregrineinc.com

About Bavituximab: A Targeted Immunotherapy
Bavituximab is a first-in-class phosphatidylserine (PS)-targeting monoclonal antibody that represents a new approach to treating cancer. To date, bavituximab has been administered to over 600 patients worldwide and appears to be safe and well tolerated. Bavituximab's target, PS, is a highly immunosuppressive lipid molecule usually located inside the membrane of healthy cells, but "flips" and becomes exposed on the outside of virus-infected cells, virus particles themselves, as well as tumor cells and cells that line tumor blood vessels, creating a specific target for anti-viral and anti-cancer treatments. PS-targeting antibodies target and bind to PS and block this immunosuppressive signal potentially enabling the immune system to better recognize and fight tumors and infectious pathogens. Data published in peer-reviewed journals shows that PS-targeting

antibodies such as bavituximab mediate important immune-stimulatory changes.[5,6] As part of the SUNRISE trial, bavituximab is being evaluated in a Phase III, global, randomized, double-blind, placebo-controlled clinical trial designed to evaluate the safety, tolerability and efficacy of bavituximab plus docetaxel as second-line treatment in patients with non-small cell lung cancer. Bavituximab is also currently being evaluated in several solid tumor indications, including breast cancer, liver cancer, rectal cancer and melanoma. For additional information about the SUNRISE trial please visit www.SunriseTrial.com or www.ClinicalTrials.gov using Identifier NCT01999673.

About Peregrine Pharmaceuticals, Inc.
Peregrine Pharmaceuticals, Inc. is a biopharmaceutical company with a pipeline of novel drug candidates in clinical trials for the treatment and diagnosis of cancer. The company's lead immunotherapy candidate, bavituximab, is in Phase III development for the treatment of second-line non-small lung cancer (the "SUNRISE trial") along with several investigator-sponsored trials evaluating other treatment combinations and additional oncology indications. The company is also advancing a molecular imaging agent, 124I-PGN650, in an exploratory clinical trial for the imaging of multiple solid tumor types. Peregrine also has in-house cGMP manufacturing capabilities through its wholly-owned subsidiary Avid Bioservices, Inc. (www.avidbio.com), which provides development and biomanufacturing services for both Peregrine and third-party customers. Additional information about Peregrine can be found at www.peregrineinc.com.

Safe Harbor Statement: Statements in this press release which are not purely historical, including statements regarding Peregrine Pharmaceuticals' intentions, hopes, beliefs, expectations, representations, projections, plans or predictions of the future are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. The forward-looking statements involve risks and uncertainties including, but not limited to, the risk that future preclinical or clinical studies with bavituximab do not establish that PS is an adequate target to clear Ebola virus and infected cells, the risk that future preclinical studies or clinical studies with bavituximab do not circumvent the problem of virus escape mutations or show that PS plays a role in immunosuppression during Ebola infection. It is important to note that the company's actual results could differ materially from those in any such forward-looking statements. Factors that could cause actual results to differ materially include, but are not limited to, uncertainties associated with completing preclinical and clinical trials for our technologies; the early stage of product development; the significant costs to develop our products as all of our products are currently in development, preclinical studies or clinical trials; obtaining additional financing to support our operations and the development of our products; obtaining regulatory approval for our technologies; anticipated timing of regulatory filings and the potential success in gaining regulatory approval and complying with governmental regulations applicable to our business. Our business could be affected by a number of other factors, including the risk factors listed from time to time in our reports filed with the Securities and Exchange Commission including, but not limited to, our annual report on Form 10-K for the fiscal year ended April 30, 2014 as well as any updates to these risk factors filed from time to time in the company's other filings with the Securities and Exchange Commission. The company cautions investors not to place undue reliance on the forward-looking statements contained in this press release. Peregrine Pharmaceuticals, Inc. disclaims any obligation, and does not undertake to update or revise any forward-looking statements in this press release.

[1] S. Bhattacharyya et al. 2013. Enveloped viruses disable innate immune responses in dendritic cells by direct activation of tam receptors. Cell Host Microbe. 14, 136-147, doi:10.1016/j.chom.2013.07.005.

[2] S. Jemielity et al. 2013. TIM-family proteins promote infection of multiple enveloped viruses through virion-associated phosphatidylserine. PLoS Pathog. 9:e1003232.

[3] K. Morizono et al. 2014. Role of Phosphatidylserine Receptors in Enveloped Virus Infection. J. Virol. 88: 4275-4290.

[4] S.K. Gire et al., 2014. Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak. Science, doi: 10.1126/science.1259657.

[5] Soares MM, King SW, Thorpe PE. Targeting inside-out phosphatidylserine as a therapeutic strategy for viral diseases. Nature Medicine 2008 Dec;14(12):1357-62.

[6] Yi Yin, Xianming Huang, Kristi D. Lynn, and Philip E. Thorpe. Phosphatidylserine-Targeting Antibody Induces M1 Macrophage Polarization and Promotes Myeloid-Derived Suppressor Cell Differentiation. Cancer Immunology Research; 1(4); 256-68.

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