March 11, 2014

# Data Presentations at Keystone Symposium Support Potential of Peregrine Pharmaceuticals' PS-Targeting Antibodies to Overcome Immune Suppression and Enhance Anti-Tumor Activity of Anti-CTLA-4 and PD-1 Antibodies

## Preclinical Studies Support Potential of Combining Upstream and Downstream Immune Checkpoint Inhibitors; Combination of Phosphatidylserine (PS) and CTLA-4 or PD-1 Targeting Antibodies Demonstrate Greater Tumor Growth Suppression and Survival Than Either Antibody Alone; Consistent Data Demonstrated Across Multiple Preclinical Cancer Models

TUSTIN, CA -- (Marketwired) -- 03/11/14 -- Peregrine Pharmaceuticals, Inc. (NASDAQ: PPHM) (NASDAQ: PPHMP) today announced that preclinical data presentations made validate the immune-stimulatory mechanism of its phosphatidylserine (PS) targeting platform while demonstrating that the combination of an anti-PS antibody and anti-CTLA-4 or anti-PD-1 antibody displayed superior tumor growth suppression than either anti-CTLA-4 or anti-PD-1 antibody alone in animal tumor models. These data were outlined in two presentations at the Keystone Immune Evolution in Cancer meeting being held March 9-13, 2014 in Whistler, British Columbia, Canada. Peregrine's lead PS-targeting antibody, bavituximab, is currently being evaluated in second-line non-small cell lung cancer (NSCLC) as part of the SUNRISE pivotal Phase III clinical trial.

In a late breaking presentation, Xianming Huang, Ph.D. of the Simmons Comprehensive Cancer Center at the University of Texas Southwestern Medical Center in Dallas provided results from studies demonstrating that PS-targeting antibodies, such as bavituximab, block an upstream immune checkpoint and reactivate tumor immunity at multiple levels.

In the poster titled: "Phosphatidylserine-Targeting Antibodies Induce M1 Macrophage Polarization, Promote Myeloid Derived Suppressor Cell Differentiation and Boost Tumor-Specific Immunity", Dr. Huang and colleagues demonstrate that PS-targeting antibodies significantly decreased the ratio of M2 to M1 tumor associated macrophages (TAM) and decreased the levels of myeloid derived suppressor cells (MDSC). In addition, PS-targeting antibodies were shown to promote and increase the frequency of dendritic cell (DC) maturation into cells having the phenotype of functional antigen presenting cells while also eliciting specific anti-tumor T-cell responses. In combination studies with anti-PD-1, tumor progression was slowed compared to anti-PD-1 treatment alone. As well, combination treated splenic T-cells produced increased levels of the cytokines IL-2 and interferon gamma.

"These data provide further validation of the immune-stimulatory properties of bavituximab blocking PS, an upstream immune checkpoint, that, in turn, initiates a series of elegant downstream steps to boost tumor-specific immunity," said Jeff T. Hutchins, Ph.D., vice president of preclinical research at Peregrine. "We believe that the mechanism of action and combination data strongly support the continued investigation into the combination of bavituximab with other immune checkpoint blockades that could synergistically induce potent long-lasting antitumor immunity."

In a poster titled: "Phosphatidylserine Targeting Antibodies Enhance the Activity of Immune Checkpoint Inhibitors in Tumors" scientists from Peregrine and the University of Texas Southwestern Medical Center demonstrate that PS-targeting antibodies enhance the anti-tumor activity of anti-CTLA-4 and anti-PD-1 antibodies through infiltration of activated immune cells in tumors and induction of adaptive immunity.

Results from these preclinical studies found that animals administered a combination of a PS-targeting antibody and an anti-CTLA-4 or an anti-PD-1 antibody exhibited greater tumor growth suppression and longer survival than anti-CTLA-4 and anti-PD1 antibodies alone. In addition, data showed that animals that survive the initial tumor challenge develop tumor-specific protective immunity and are resistant to re-challenge of the initial tumor. Lastly, tumors from animals treated with PS-targeting in combination with anti-CTLA-4 antibodies show strong and uniform T-cell and macrophage infiltration by immunohistochemical staining.

"These data build on the encouraging data we announced last year showing that the combination of bavituximab and an anti-CTLA-4 antibody yielded enhanced anti-tumor activity in a pre-clinical model of melanoma," said Jeff T. Hutchins, Ph.D. "While this is early data, it is compelling in that the combinations of bavituximab with an anti-CTLA-4 or an anti-PD-1 antibody clearly show both a delay in tumor growth and a decrease in the number of animals with tumor progression. In addition, the discovery

of tumor-specific immunity to re-challenge support further investigation into the mechanisms involved and the potential for clinical investigation of these promising upstream and downstream immune checkpoint blockade combinations."

"Data such as these are extremely valuable as we begin to advance novel immunotherapy combinations into the clinic," said Joseph Shan, vice president of clinical and regulatory affairs at Peregrine. "We are already on the cusp of seeing the first clinical trial initiated to evaluate the combination of bavituximab with the approved anti-CTLA-4 targeting antibody ipilimumab and we look forward to advancing other immunotherapy combinations into the clinic as more data becomes available."

***About Bavituximab: A Targeted Immunotherapy***
Bavituximab is a first-in-class phosphatidylserine (PS)-targeting monoclonal antibody that represents a new approach to treating cancer. PS is a highly immunosuppressive molecule usually located inside the membrane of healthy cells, but "flips" and becomes exposed on the outside of cells that line tumor blood vessels, creating a specific target for anti-cancer treatments. PS-targeting antibodies target and bind to PS and block this immunosuppressive signal, thereby enabling the immune system to recognize and fight the tumor. These data detailing the immune-stimulatory mechanism of action of PS-targeting antibodies, such as the company's lead drug candidate bavituximab, are the subject of a manuscript published in the October 2013 issue of the American Association for Cancer Research (AACR) peer-reviewed journal, Cancer Immunology Research . Bavituximab is currently being evaluated in several solid tumor indications, including non-small cell lung cancer, breast cancer, liver cancer and rectal cancer with a trial in advanced melanoma anticipated to initiate in the near future.

***About Keystone Symposia***
Keystone Symposia serve as a catalyst for the advancement of biomedical and life sciences by connecting scientists within and across disciplines at conferences and workshops held at venues that create an environment conducive to information exchange, generation of new ideas and acceleration of applications that benefit society.

Copies of these posters are located in the Upcoming Events section of the Investors tab of Peregrine's website www.peregrineinc.com.

***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 is developing multiple clinical programs in cancer with its lead immunotherapy candidate bavituximab while seeking a partner to further advance its novel brain cancer agent Cotara®. 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 the results from human clinical studies involving combinations of bavituximab with an anti-CTLA-4 or an anti-PD-1 antibody may not correlate with the data from the preclinical studies. 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 SEC including, but not limited to, our annual report on Form 10-K for the fiscal year ended April 30, 2013 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.

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Source: Peregrine Pharmaceuticals