Ionis and Akcea Enter into Strategic Collaboration with Global Pharmaceutical Company to Develop and Commercialize AKCEA-APO(a)-L_{rx} and AKCEA-APOCIII-L_{rx}

- *Collaboration with Novartis provides near-term payments of $225 million plus potential license fees, milestone and royalty payments*
- *Akcea retains rights to co-commercialize to lipid specialists*
- *Deal valued at significantly over $1 billion if both drugs are licensed and successfully commercialized*
- *Company to host conference call at 9:30 a.m. Eastern Time*

CARLSBAD, Calif. and CAMBRIDGE, Mass., January 6, 2017 – Ionis Pharmaceuticals Inc. (NASDAQ: IONS) and Akcea Therapeutics, a wholly-owned subsidiary of Ionis Pharmaceuticals, Inc., today announced an exclusive, worldwide option and collaboration agreement with Novartis to develop and commercialize AKCEA-APO(a)-L_{Rx} and AKCEA-APOCIII-L_{Rx}. Ionis and Akcea are eligible to receive $225 million in near-term payments, including an immediate $75 million up-front option payment and a $100 million equity investment in Ionis, which equates to 1,631,435 shares at $61.30 per share. Ionis and Akcea are also eligible to receive a license fee as well as development, regulatory and commercial milestone payments as each drug advances. In addition, Ionis and Akcea are eligible to receive tiered royalties in the mid-teens to low twenty percent range on net sales of each drug.

"AKCEA-APO(a)-L_{Rx} and AKCEA-APOCIII-L_{Rx} are novel potential therapies to address the broad opportunities that still exist to treat cardiovascular disease, despite currently available therapies. We believe that Novartis is the ideal partner for developing both drugs to their fullest potential, " said Paula Soteropoulos, chief executive officer at Akcea Therapeutics. "We are advancing our pipeline of novel drugs to treat previously inadequately treated lipid disorders by pursuing indications that drive the greatest near- and long-term value. This strategic partnership allows us to move more rapidly to Phase 3 cardiovascular outcomes studies with both therapies than our original development plan. Our ability to benefit from Novartis' global commercialization resources and complement them with Akcea's specialized sales force focused on lipid specialists should allow us to maximize the commercial potential of each drug."

Ionis and Akcea plan to conduct a Phase 2 dose-ranging study for each drug, to choose the optimal dose and evaluate alternative dose schedules, such as monthly dosing, for the Phase 3 study. Following the successful completion of each Phase 2 dose-ranging study, and prior to initiation of the Phase 3 study, Novartis will be able to exercise its option to license and commercialize each drug.

For each drug, upon option exercise, Novartis will pay Ionis and Akcea a $150 million license fee, will initiate a global Phase 3 cardiovascular outcome study in a high-risk population and will be responsible for worldwide development and commercialization activities. Akcea retains the right to co-commercialize any successful drug through its specialty sales force focused on lipid specialists on terms and conditions to be agreed with Novartis. Ionis and Akcea are also eligible to receive up to $315 million and $265 million in development and regulatory milestone payments for AKCEA-APO(a)-L_{Rx} and AKCEA-APOCIII-L_{Rx}, respectively, as well as up to $285 million and $265 million in commercialization milestone

payments, for each drug, respectively. Novartis has an obligation to make a further equity investment of $50 million in the next 18 months in either Ionis at the same premium as the initial investment or in Akcea.

The transaction is subject to clearances under the Hart-Scott-Rodino Antitrust Improvements Act.

Conference Call
Ionis will host a conference call to discuss the strategic collaboration with Novartis on Friday, January 6 at 9:30 a.m. Eastern Time. Interested parties may access the conference call at www.ionispharma.com or listen by phone by dialing 877-443-5662. A recording of the call will be available for a limited time at the same address.

ABOUT Lp(a)
Lp(a) is considered a key driver for cardiovascular disease due to its association with an increased risk of coronary heart disease. Lp(a) is a lipoprotein particle that is assembled in the liver and consists of the apolipoprotein(a) protein covalently linked to LDL-cholesterol. Diet and lifestyle changes have little impact on Lp(a) levels and current therapies are not able to adequately reduce elevated levels of Lp(a) to acceptable levels in patients who have severely elevated Lp(a). Additional information is available through Lipoprotein (a) Foundation at www.lipoproteinafoundation.org.

In a Phase 1/2a study in healthy volunteers with elevated Lipoprotein(a), AKCEA-APO(a)-L_{Rx} produced significant and sustained reductions in Lp(a) of up to 97% with mean reduction of 79% after only a single, small volume dose and with multiple doses, observed reductions of Lp(a) of up to 99% with a mean reduction of 92%.

ABOUT APOCIII AND TRIGLYCERIDES
ApoC-III is a protein produced in the liver that plays a central role in the regulation of serum triglycerides. Humans who do not produce ApoC-III have lower levels of triglycerides and lower instances of cardiovascular disease. Humans with elevated levels of ApoC-III have high triglycerides associated with multiple metabolic abnormalities, such as insulin resistance and/or metabolic syndrome. In addition, the prevalence of type 2 diabetes is increased in patients with elevated triglycerides.

AKCEA-APOCIII-L_{Rx} is currently being evaluated in a Phase 1/2a study in healthy volunteers with elevated triglycerides.

ABOUT AKCEA THERAPEUTICS
Akcea Therapeutics is focused on developing and commercializing drugs for patients with serious cardiometabolic diseases caused by lipid disorders. Established as a wholly owned subsidiary of Ionis Pharmaceuticals, Inc., Akcea has a robust portfolio of development-stage drugs covering multiple targets and disease states. The drugs in Akcea's pipeline are designed using Ionis' advanced RNA-targeted antisense technology to address a number of lipid risk factors, including, ApoC-III, triglycerides, Lp(a) and LDL-cholesterol. Akcea's most advanced program, volanesorsen, is in Phase 3 development to treat patients with either familial chylomicronemia syndrome (FCS) or familial partial lipodystrophy (FPL), two orphan lipid disorders that are characterized by extremely high triglycerides and ApoC-III. Akcea is located in Cambridge, Massachusetts. Additional information about Akcea is available at http://akceatx.com.

ABOUT IONIS PHARMACEUTICALS, INC.
Ionis is the leading company in RNA-targeted drug discovery and development focused on developing drugs for patients who have the highest unmet medical needs, such as those patients with severe and rare diseases. Using its proprietary antisense technology, Ionis has created a large pipeline of first-in-class or best-in-class drugs, with over three dozen drugs in development. SPINRAZA™ (nusinersen) is a drug that has been approved in the U.S. for the treatment of spinal muscular atrophy (SMA) in pediatric and adult patients. Biogen is responsible for commercialization of SPINRAZA. Drugs currently in Phase 3 development include volanesorsen, a drug Ionis is developing and plans to commercialize through its wholly owned subsidiary, Akcea Therapeutics, to treat patients with either familial chylomicronemia syndrome or familial partial lipodystrophy; and IONIS-TTR_{Rx}, a drug Ionis is developing with GSK to

treat patients with TTR amyloidosis. Ionis' patents provide strong and extensive protection for its drugs and technology. Additional information about Ionis is available at www.ionispharma.com.

IONIS' FORWARD-LOOKING STATEMENT

This press release includes forward-looking statements regarding Ionis Pharmaceuticals' business, its agreement with Novartis, and the development, activity, therapeutic and commercial potential and safety of IONIS-APO(a)-L_{Rx} and IONIS-APOCIII-L_{Rx}. Any statement describing Ionis' goals, expectations, financial or other projections, intentions or beliefs is a forward-looking statement and should be considered an at-risk statement. Such statements are subject to certain risks and uncertainties, particularly those inherent in the process of discovering, developing and commercializing drugs that are safe and effective for use as human therapeutics, and in the endeavor of building a business around such drugs. Ionis' forward-looking statements also involve assumptions that, if they never materialize or prove correct, could cause its results to differ materially from those expressed or implied by such forward-looking statements. Although Ionis' forward-looking statements reflect the good faith judgment of its management, these statements are based only on facts and factors currently known by Ionis. As a result, you are cautioned not to rely on these forward-looking statements. These and other risks concerning Ionis' programs are described in additional detail in Ionis' annual report on Form 10-K for the year ended December 31, 2015, and its most recent quarterly report on Form 10-Q, which are on file with the SEC. Copies of these and other documents are available from the Company.

In this press release, unless the context requires otherwise, "Ionis," "Company," "we," "our," and "us" refers to Ionis Pharmaceuticals and its subsidiaries.

Ionis Pharmaceuticals Investor and Media Contact:
D. Wade Walke, Ph.D.
Vice President, Corporate Communications and Investor Relations
760-603-2741

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