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Novartis presents first-of-its-kind evidence at AAN reinforcing robust and consistent efficacy of Aimovig™* (erenumab) for migraine patients with multiple treatment failures

- *The LIBERTY trial studied patients with episodic migraine who had failed 2 to 4 prior treatments, a uniquely difficult-to-treat population often excluded from migraine prevention trials*
- *Patients taking erenumab had nearly three-fold higher odds of having their migraine days cut by half or more compared to placebo*
- *Study completion, safety and tolerability were consistent with results seen in the pivotal clinical program - over 97% of those taking erenumab completed the double-blind treatment phase and erenumab showed a placebo-like safety and tolerability profile*
- *Data selected by the American Academy of Neurology Science Committee as one of the most noteworthy presentations at this year's annual meeting*

Basel, April 17, 2018 – Novartis today announced full results from the Phase IIIb LIBERTY trial of Aimovig (erenumab, AMG 334) in episodic migraine patients who had previously failed two to four preventive treatments, due to lack of efficacy or intolerable side effects[1]. The data, which will be presented at the annual meeting of the American Academy of Neurology (AAN) in Los Angeles, show the potential of investigational erenumab as an effective preventive treatment option for these patients, who have tried several treatment options without gaining relief. Erenumab is the only fully human monoclonal antibody under regulatory review that was designed to selectively block the calcitonin gene-related peptide (CGRP) receptor, which plays a critical role in migraine activation. LIBERTY is the first study to investigate a treatment targeting the CGRP pathway specifically in this challenging patient population.

In LIBERTY, 246 patients who had experienced two to four previous preventive treatment failures were randomized to receive monthly subcutaneous injections of either erenumab 140mg or placebo for 12 weeks. Patients taking erenumab had nearly three-fold higher odds of having their migraine days cut by at least 50%, with more than twice as many patients taking erenumab achieving this reduction compared to placebo (weeks 9-12: 30.3% with erenumab, 13.7% with placebo, p=0.002, odds ratio 2.73).

"The LIBERTY study distinctively demonstrates the ability of an anti-CGRP receptor antibody to significantly reduce migraine frequency and its associated burden in patients who could not find the relief they need with the currently available preventive treatment options," said Prof. Uwe Reuter, Managing Medical Director at Charité Universitätsmedizin. "These compelling data offer new hope of fewer migraine days to those people with migraine who may have cycled through current standard of care unsuccessfully for years due to lack of efficacy and tolerability."

In the study, patients taking erenumab also had statistically significant and clinically meaningful improvements from baseline compared to placebo across all secondary endpoints:

- Reduction in monthly migraine days
- Decrease in acute migraine-specific drug use
- 75% or greater reduction in monthly migraine days
- 100% reduction in monthly migraine days
- Improved physical functioning and ability to complete everyday activities as measured by the Migraine Physical Function Impact Diary (MPFID) scales

Over 97% of erenumab patients completed the double-blind phase of the LIBERTY study. There were no adverse events leading to discontinuation of treatment in the erenumab group while 0.8% of those in the placebo group experienced adverse events leading to discontinuation of treatment.

“In LIBERTY, all primary and secondary endpoints were met. These data, combined with the previously reported positive results, further reinforce erenumab’s robust efficacy and safety profile seen across the full spectrum of migraine,” said Danny Bar-Zohar, Global Head of Neuroscience Development at Novartis. “We strive to demonstrate that our novel therapies provide high value to those patients who continue to suffer, despite standard of care and so we are excited to bring this targeted prevention option, and hope, to these patients as soon as we can.”

LIBERTY contributes to an extensive body of evidence, across the spectrum of migraine, in support of the sustained efficacy, safety and tolerability profile of erenumab including four placebo-controlled Phase II and Phase III clinical studies involving more than 3,000 patients, as well as ongoing open-label extension trials up to five years in duration. If approved, erenumab will be administered every four weeks using a self-injection device. Subject to approval, Novartis and Amgen will co-commercialize erenumab in the US. Amgen has exclusive commercialization rights to the drug in Japan and Novartis has exclusive rights to commercialize in the rest of the world.

*The brand name Aimovig™ has been provisionally approved by the FDA and EMA for the investigational product erenumab (AMG 334), but the product itself has not been approved for sale in any country.

About LIBERTY

LIBERTY (NCT03096834) is a Phase IIIb, multicenter, randomized 12-week, double-blind, placebo-controlled study evaluating the safety and efficacy of erenumab in patients with episodic migraine (defined in the trial as four to 14 migraine days per month at baseline) who have failed two to four prior preventive treatments for migraine. In the study, 246 participants were randomized to receive erenumab140mg or placebo during the 12-week double-blind treatment phase. The primary endpoint was the percentage of patients with at least 50% reduction of monthly migraine days from baseline over the last four weeks of the double-blind treatment phase of the study (weeks 9-12)[2]. The trial includes an ongoing 52 week open-label extension study.

Secondary endpoints assessed during the same time period included: change from baseline in monthly migraine days, change from baseline in the number of monthly acute migraine-specific medication treatment days, change from baseline in the Migraine Physical Function Impact Diary (MPFID) physical impairment and impact on everyday activities domain scores. The MPFID is a scale developed to measure these two domains. It has been validated in line with US Food and Drug Administration Patient Reported Outcomes Guidance[3]. Percentages of patients with a 75% response rate and 100% response rate to erenumab, and safety and tolerability were also assessed as secondary endpoints.

About Aimovig (erenumab)
Aimovig (erenumab, AMG 334) is the only investigational treatment under regulatory review that was specifically designed to prevent migraine by blocking the CGRP receptor, which plays an important role in migraine activation. Aimovig has been studied in several large, global, randomized, double-blind, placebo-controlled studies to assess its safety and efficacy in migraine prevention. More than 3,000 patients have participated in our clinical trial program including the four placebo-controlled Phase II and Phase III clinical studies and their open-label extensions. The brand name Aimovig™ has been provisionally approved by the FDA and EMA for the investigational product erenumab (AMG 334), but the product itself has not been approved for sale in any country.

About Migraine
Migraine is a distinct neurological disease[4]. It involves recurrent attacks of moderate to severe head pain that is typically pulsating, often unilateral and associated with nausea, vomiting and sensitivity to light, sound and odors[5]. Migraine is associated with personal pain, disability and reduced quality of life, and financial cost to society[6]. It has a profound and limiting impact on an individual's abilities to carry out everyday tasks, and was declared by the World Health Organization to be one of the top 10 causes of years lived with disability for men and women[7]. It remains under-recognized and under-treated[6,8]. Existing preventive therapies have been repurposed from other indications and are often associated with poor tolerability and lack of efficacy, with high discontinuation rates among patients[9].

About Amgen and Novartis Neuroscience Collaboration
In August 2015, Amgen entered into a global collaboration with Novartis to develop and commercialize pioneering treatments in the field of migraine and Alzheimer's disease. The collaboration focuses on investigational Amgen drugs in the migraine field, including erenumab (Biologics License Application submitted to FDA in May 2017) and AMG 301 (currently in Phase II development). In April 2017, the collaboration was expanded to include co-commercialization of erenumab in the U.S. For the migraine programs, Amgen retains exclusive commercialization rights in the U.S. (other than for erenumab as described above) and Japan, and Novartis has exclusive commercialization rights in Europe, Canada and rest of world. Also, the companies are collaborating in the development and commercialization of a beta-secretase 1 (BACE) inhibitor program in Alzheimer’s disease. The oral therapy CNP520 (currently in Phase III for Alzheimer’s disease) is the lead molecule and further compounds from both companies' pre-clinical BACE inhibitor programs may be considered as follow-on molecules.

Disclaimer
This press release contains forward-looking statements within the meaning of the United States Private Securities Litigation Reform Act of 1995. Forward-looking statements can generally be identified by words such as “potential,” “can,” “will,” “plan,” “expect,” “anticipate,” “look forward,” “believe,” “committed,” “investigational,” “pipeline,” “launch,” or similar terms, or by express or implied discussions regarding potential marketing approvals, new indications or labeling for erenumab (AMG 334) or the other investigational or approved products described in this press release, or regarding potential future revenues from such products or the collaboration with Amgen. You should not place undue reliance on these statements. Such forward-looking statements are based on our current beliefs and expectations regarding future events, and are subject to significant known and unknown risks and uncertainties. Should one or more of these risks or uncertainties materialize, or should underlying assumptions prove incorrect, actual results may vary materially from those set forth in the forward-looking statements. There can be no guarantee that erenumab (AMG 334) or the other investigational or approved products described in this press release will be submitted or approved for sale or for any additional indications or labeling in any market, or at any particular time. Neither can there be any guarantee that the collaboration with Amgen will achieve any or all of its intended goals and objectives, or be commercially successful. Nor can there be any guarantee that erenumab (AMG 334) or the other investigational or approved products

described in this press release will be commercially successful in the future. In particular, our expectations regarding such products, and the collaboration with Amgen, could be affected by, among other things, the uncertainties inherent in research and development, including clinical trial results and additional analysis of existing clinical data; regulatory actions or delays or government regulation generally; global trends toward health care cost containment, including government, payor and general public pricing and reimbursement pressures; our ability to obtain or maintain proprietary intellectual property protection; the particular prescribing preferences of physicians and patients; general political and economic conditions; safety, quality or manufacturing issues; potential or actual data security and data privacy breaches, or disruptions of our information technology systems, and other risks and factors referred to in Novartis AG's current Form 20-F on file with the US Securities and Exchange Commission. Novartis is providing the information in this press release as of this date and does not undertake any obligation to update any forward-looking statements contained in this press release as a result of new information, future events or otherwise.

About Novartis
Novartis provides innovative healthcare solutions that address the evolving needs of patients and societies. Headquartered in Basel, Switzerland, Novartis offers a diversified portfolio to best meet these needs: innovative medicines, cost-saving generic and biosimilar pharmaceuticals and eye care. Novartis has leading positions globally in each of these areas. In 2017, the Group achieved net sales of USD 49.1 billion, while R&D throughout the Group amounted to approximately USD 9.0 billion. Novartis Group companies employ approximately 122,000 full-time-equivalent associates. Novartis products are sold in approximately 155 countries around the world. For more information, please visit http://www.novartis.com.

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