UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

DIVISION OF
CORPORATION FINANCE

December 2, 2010

John M. Maraganore, Ph.D.
Chief Executive Officer
Alnylam Pharmaceuticals, Inc.
300 Third Street
Cambridge, MA 02142

Re: Alnylam Pharmaceuticals, Inc.
Form 10-K
Filed February 26, 2010
File No. 000-50743

Dear Mr. Maraganore:

We have reviewed your filing and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter within ten business days by providing the requested information, or by advising us when you will provide the requested response. If you do not believe our comments apply to your facts and circumstances, please tell us why in your response.

After reviewing the information you provide in response to these comments, we may have additional comments.

Form 10-K, filed February 26, 2010

Business, page 2

1. We note that you have included as exhibits various license agreements with each of Cancer Research Technology Limited, Carnegie Institution of Washington, Cold Spring Harbor Laboratory, Garching Innovation GmbH (now known as Max Planck Innovation GmbH) and The Board of Trustees of the Leland Stanford Junior University. Please describe the material terms of each of these agreements, including, but not limited to any payment provisions, a range of royalty rates, aggregate milestones, usage restrictions, exclusivity provisions and duration and termination provisions.

Kyowa Hakko Kirin, page 20

2. Please file as an exhibit in your 2010 Form 10-K, the license and collaboration agreement with Kyowa Hakko Kirin dated June 2008. Alternatively, tell us the basis for your belief that you are not required to file this agreement pursuant to Item 601(b)(10)(ii)(B) of

Regulation S-K.

Delivery Initiatives, page 24

3. We note that during 2007, you obtained an exclusive worldwide license to the liposomal delivery formulation technology of Tekmira for the discovery, development and commercialization of LNP formulations for the delivery of RNAi therapeutics, and a non-exclusive worldwide license to certain liposomal delivery formulation technology of Protiva Biotherapeutics Inc., for the discovery, development and commercialization of certain LNP formulation for the delivery of RNAi therapeutics. Please provide the material terms of each of these license agreements with Tekmira and Protiva, including, but not limited to any payment provisions, a range of royalty rates, aggregate milestones, usage restrictions and duration and termination provisions. Also, please file these agreements as exhibits in your 2010 Form 10-K, or alternatively, tell us the basis for your belief that you are not required to file these agreements pursuant to Item 601(b)(10)(ii)(B) of Regulation S-K.

Manufacturing, page 39

4. We note that in 2009, you entered into a manufacturing and supply agreement with Tekmira where you are committed to pay Tekmira a minimum of CAD $11.2 million (representing U.S. $9.2 million at the time of execution) through December 2011 for manufacturing services. Please file the agreement as an exhibit in your 2010 Form 10-K, or alternatively, tell us the basis for your belief that you are not required to file the agreement pursuant to Item 601(b)(10)(ii)(B) of Regulation S-K.

Proxy Statement on Schedule 14A, filed April 20, 2010

2009 Annual Incentive Program, page 26

5. We note that your annual cash incentive award is based on the achievement of corporate goals and individual objectives. However, your discussion does not disclose the corporate goals used as part of the determination of annual cash incentive awards. In addition, while your discussion does disclose individual objectives, it does not quantify any targeted levels of achievement or actual levels of achievement, where these objectives are quantitative. Please provide draft disclosure for your 2011 proxy statement which provides your 2010 corporate goals and individual objectives as well as the targeted levels of achievement. To the extent that the goals and objectives are quantitative, the discussion of goals and achievements should also be quantitative. Please also confirm that in your 2011 proxy statement you will discuss the levels of achievement of the goals and objectives for each Named Executive Officer.

Form 10-Q for the Quarterly Period Ended September 30, 2010

Strategic Alliances, page 23

6. We note that in November 2010, you formed a collaboration with Medtronic and CHDI to advance ALN-HTT. We also note that in the United States, you have the opportunity to invest in clinical development through product launch in return for a proportional share of the profits, and in Europe, Medtronic is solely responsible for development and commercialization, and you are eligible to receive milestones and royalties on product sales, if any. Please describe the material terms of the collaboration agreement, including, but not limited to the material obligations and rights of each party to the agreement, the payment provisions, a range of royalty rates, aggregate milestones and duration and termination provisions. Also, please file the agreement as an exhibit in your 2010 Form 10-K, or alternatively, tell us the basis for your belief that you are not required to file the agreement pursuant to Item 601(b)(10)(ii)(B) of Regulation S-K.

We urge all persons who are responsible for the accuracy and adequacy of the disclosure in the filing to be certain that the filing includes the information the Securities Exchange Act of 1934 and all applicable Exchange Act rules require. Since the company and its management are in possession of all facts relating to a company's disclosure, they are responsible for the accuracy and adequacy of the disclosures they have made.

In responding to our comments, please provide a written statement from the company acknowledging that:

- the company is responsible for the adequacy and accuracy of the disclosure in the filing;
- staff comments or changes to disclosure in response to staff comments do not foreclose the Commission from taking any action with respect to the filing; and
- the company may not assert staff comments as a defense in any proceeding initiated by the Commission or any person under the federal securities laws of the United States.

You may contact Johnny Gharib at (202) 551-3170 or me at (202) 551-3715 if you have any questions.

Sincerely,

Jeffrey Riedler
Assistant Director