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

DIVISION OF
CORPORATION FINANCE

February 11, 2011

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 response letter dated January 12, 2011 and have the following comments.

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 your response to our prior comment 1 and your disclosure regarding your license agreement with Max Planck Innovation that you will be required to pay future royalties on net sales of all therapeutic and prophylactic products. Please revise your disclosure to include a range of royalty rates not to exceed ten percent. An acceptable range of royalties is one of the following: “single-digits,” “teens,” “twenties,” etc.

Kyowa Hakko Kirin, page 20

2. We note your response to our prior comment 2 that under the Kyowa Hakko Kirin agreement, there are modest development and sales milestone payments and royalty rates. However, we also note in your 2009 Form 10-K that Kyowa Hakko Kirin paid you an upfront cash payment of $15 million and is required to make payments to you upon achievement of specified development sales milestones totaling up to $78 million in addition to royalty payments based on annual net sales. These amounts do not appear to

be modest given that you had revenues of approximately $100 million and net losses of approximately $47.6 million in 2009. Please file as an exhibit to your 2010 Form 10-K, the license and collaboration agreement with Kyowa Haddo Kirin dated June 2008.

Delivery Initiatives, page 24

3. We note your response to our prior comment 3 and your disclosure that Tekmira and Protiva are eligible to receive royalty payments on annual product sales for each RNAi therapeutic formulated using Tekmira's or Protiva's liposomal delivery formulation technologies, and that you are eligible to receive royalties on annual sales of RNAi therapeutic products for which you granted Tekmira and Protiva licenses. Please revise your disclosure to include a range of royalty rates not to exceed ten percent for royalties that you will pay to and receive from Tekmira and Protiva. An acceptable range of royalties is one of the following: "single-digits," "teens," "twenties," etc.

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

2009 Annual Incentive Program, page 26

4. We note your response to our prior comment 5 and your disclosure regarding 2010 corporate goals and individual objectives. We also note your discussion of Ms. Allen's individual objectives which are partly focused on meeting specified financial goals, including meeting specified operating expense levels and minimum cash balance requirements at year-end. These objectives appear to be quantitative. To the extent that the objectives are quantitative, please revise your disclosure so that the discussion of objectives and achievements is also quantitative.

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