



DIVISION OF  
CORPORATION FINANCE

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

May 17, 2017

David Lowe  
President and Chief Executive Officer  
Aeglea BioTherapeutics, Inc.  
901 S. MoPac Expressway  
Barton Oaks Plaza One, Suite 250  
Austin, TX 78746

**Re: Aeglea BioTherapeutics, Inc.  
Registration Statement on Form S-3  
Response Dated May 12, 2017  
File No. 333-217573**

Dear Mr. Lowe:

We have reviewed your May 12, 2017 response to our comment letter and have the following comment. 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 by amending your registration statement and providing the requested information. If you do not believe our comment applies to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing any amendment to your registration statement and the information you provide in response to the comment we may have additional comments.

Registration Statement on Form S-3

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1. We acknowledge your response to prior comment 1, and your statement that there were 10,140,561 shares that were held by non-affiliates of the company on March 20, 2017. However, we note that you stated in your Form 10-K that as of June 30, 2016, the market value of your shares held by non-affiliates was approximately \$24.6 million, based on the per share price of \$4.86, which indicates that there were approximately 5 million shares that were held by non-affiliates at that time. We have not noted substantial changes in your number of shares outstanding or a decrease in the holdings of your other significant shareholders since June 2016. Accordingly, please explain how you

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have changed your calculation of the market value of your non-affiliate shares and why.

We remind you that the company and its management are responsible for the accuracy and adequacy of their disclosures, notwithstanding any review, comments, action or absence of action by the staff.

Refer to Rules 460 and 461 regarding requests for acceleration. Please allow adequate time for us to review any amendment prior to the requested effective date of the registration statement.

Please contact Dorrie Yale at 202-551-8776 or Erin Jaskot, Special Counsel, at 202-551-3442 with any questions.

Division of Corporation Finance  
Office of Healthcare & Insurance