



DIVISION OF
CORPORATION FINANCE

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

March 24, 2016

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

**Re: Aeglea BioTherapeutics, Inc.
Amendment No. 3 to Registration Statement on
Form S-1
Filed March 14, 2016
File No. 333-205001**

Dear Dr. Lowe:

We have reviewed your amended registration statement 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 by amending your registration statement and providing the requested information. If you do not believe our comments apply 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 these comments, we may have additional comments.

Risk Factors

"We have only very recently initiated enrollment..." page 18

1. We note your disclosure that you have observed serious adverse events, including death, in some of the patients in your ongoing Phase 1 clinical trial. Here, or in an appropriate section of your document, please expand your disclosure to list all serious adverse events reported to date and the number of patients who have reported such events, or provide us with an analysis as to why expanded disclosure here or elsewhere would not be material.

Business

Our Development Programs

AEB1102, page 80

2. We note the following statement on page 81: “In addition, in the first 11 patients in our Phase 1 dose escalation trial in patients with advanced solid tumors, we have observed a temporary reduction in blood arginine levels.” However, we note your disclosure throughout the registration statement that only “seven patients in total” have been treated in your Phase 1 clinical trial. Please correct any typographical error or explain the reason for the inconsistency.

Executive and Director Compensation

Summary Compensation Table, page 115

3. We note your statement in footnote (4) to the Summary Compensation Table explaining that: “Mr. Hebel performed consulting services for us prior to joining the company as an executive employee in May 2015. Compensation reflected in the table above includes only compensation paid during the period of employment as an executive officer.” However, in footnote (5) to the same table you state that the amount under “All Other Compensation” includes Mr. Hebel’s “...pre-employment consulting fees of \$71,369...” If it is not accurate, please remove footnote (4).

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 Act of 1933 and all applicable Securities 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.

Notwithstanding our comments, in the event you request acceleration of the effective date of the pending registration statement, please provide a written statement from the company acknowledging that:

- should the Commission or the staff, acting pursuant to delegated authority, declare the filing effective, it does not foreclose the Commission from taking any action with respect to the filing;
- the action of the Commission or the staff, acting pursuant to delegated authority, in declaring the filing effective, does not relieve the company from its full responsibility for the adequacy and accuracy of the disclosure in the filing; and

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- the company may not assert staff comments and the declaration of effectiveness as a defense in any proceeding initiated by the Commission or any person under the federal securities laws of the United States.

Please refer to Rules 460 and 461 regarding requests for acceleration. We will consider a written request for acceleration of the effective date of the registration statement as confirmation of the fact that those requesting acceleration are aware of their respective responsibilities under the Securities Act of 1933 and the Securities Exchange Act of 1934 as they relate to the proposed public offering of the securities specified in the above registration statement. Please allow adequate time for us to review any amendment prior to the requested effective date of the registration statement.

Please contact Christina Thomas at (202) 551-3577 or Mary Beth Breslin at (202) 551-3625 or me at (202) 551-3675 with any questions.

Sincerely,

/s/ Mary Beth Breslin for

Suzanne Hayes
Assistant Director
Office of Healthcare and Insurance

cc: Robert A. Freedman
Fenwick & West LLP