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**UNITED STATES  
SECURITIES AND EXCHANGE COMMISSION**  
Washington, D.C. 20549

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**POST EFFECTIVE AMENDMENT NO. 1 TO:**

**FORM S-8 REGISTRATION STATEMENT NO. 333-181324  
FORM S-8 REGISTRATION STATEMENT NO. 333-192248  
FORM S-8 REGISTRATION STATEMENT NO. 333-209395  
FORM S-8 REGISTRATION STATEMENT NO. 333-226839  
FORM S-8 REGISTRATION STATEMENT NO. 333-260910**

***UNDER  
THE SECURITIES ACT OF 1933***

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**Organovo Holdings, Inc.**

(Exact name of registrant as specified in its charter)

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**Delaware**  
(State or other jurisdiction of  
incorporation or organization)

**27-1488943**  
(I.R.S. Employer  
Identification No.)

**11555 Sorrento Valley Rd., Suite 100  
San Diego, CA 92121**  
(Address of Principal Executive Offices) (Zip Code)

**Organovo Holdings, Inc. Amended and Restated 2012 Equity Incentive Plan  
Organovo Holdings, Inc. 2022 Equity Incentive Plan**  
(Full title of the plans)

**Keith Murphy**  
Executive Chairman  
Organovo Holdings, Inc.  
11555 Sorrento Valley Rd., Suite 100  
San Diego, CA 92121  
(858) 224-1000  
(Name, address and telephone number, including area code, of agent for service)

*Copies to:*

**Jeffrey T. Hartlin, Esq.  
Samantha H. Eldredge, Esq.  
Paul Hastings LLP  
1117 S. California Avenue  
Palo Alto, California 94304  
(650) 320-1800**

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Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input checked="" type="checkbox"/>	Smaller reporting company	<input checked="" type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act.

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## EXPLANATORY NOTE

Pursuant to Securities Act Forms Compliance and Disclosure Interpretation 126.43 (“C&DI 126.43”) published by the Securities and Exchange Commission (the “Commission”), Organovo Holdings, Inc. (the “Registrant”) is filing this Post-Effective Amendment No. 1 to Registration Statements on Form S-8 (this “Post-Effective Amendment”) to the following registration statements on Form S-8 (collectively, the “Prior Registration Statements”) filed by the Registrant with the Commission (all share amounts listed below have been adjusted to reflect the 1-for-20 reverse split of the Registrant’s common stock, \$0.001 par value per share (“Common Stock”), effected on August 18, 2020):

- 1) Registration Statement on Form S-8 (File No. 333-181324) filed on May 10, 2012, with respect to 327,699 shares of Common Stock to be issued under the Organovo Holdings, Inc. 2012 Equity Incentive Plan, as amended (the “2012 Plan”);
- 2) Registration Statement on Form S-8 (File No. 333-192248) filed on November 8, 2013, with respect to 250,000 shares of Common Stock to be issued under the 2012 Plan;
- 3) Registration Statement on Form S-8 (File No. 333-209395) filed on February 4, 2016, with respect to 300,000 shares of Common Stock to be issued under the 2012 Plan;
- 4) Registration Statement on Form S-8 (File No. 333-226839) filed on August 14, 2018, with respect to 550,000 shares of Common Stock to be issued under the 2012 Plan; and
- 5) Registration Statement on Form S-8 (File No. 333-260910) filed on November 9, 2021, with respect to 900,000 shares of Common Stock to be issued under the 2012 Plan.

On October 12, 2022, the Registrant’s stockholders approved the Organovo Holdings, Inc. 2022 Equity Incentive Plan (the “2022 Plan”), which replaces the 2012 Plan. No further awards will be made under the 2012 Plan.

The number of shares of Common Stock initially authorized for issuance pursuant to the awards under the 2022 Plan is equal to (a) 1,236,738 shares of Common Stock, plus (b) any shares subject to awards granted under the 2012 Plan that, on or after October 12, 2022, expire or otherwise terminate without having been exercised or issued in full or are forfeited to or repurchased by the Registrant due to failure to vest, with the maximum number of shares to be added to the 2022 Plan pursuant to clause (b) equal to 1,367,722 shares of Common Stock (such shares under clause (b), the “Carryover Shares”)

Contemporaneously with the filing of this Post-Effective Amendment, the Registrant is filing a Registration Statement on Form S-8 to register the 1,236,738 newly authorized shares of Common Stock that have become available for offer or sale pursuant to the 2022 Plan, which number does not include the Carryover Shares.

In accordance with C&DI 126.43 and pursuant to the undertaking in Item 512(a)(1)(iii) of Regulation S-K that the Registrant disclose a material change in the plan of distribution as it was originally disclosed in the Prior Registration Statements, this Post-Effective Amendment is filed to indicate that the Prior Registration Statements will also cover the issuance of the Carryover Shares under the 2022 Plan (as such shares would no longer be issuable under the 2012 Plan as described above). No additional securities are being registered by this Post-Effective Amendment.

## PART I

### INFORMATION REQUIRED IN THE SECTION 10(a) PROSPECTUS

The information specified in Item 1 and Item 2 of Part I of Form S-8 is omitted from this Post-Effective Amendment in accordance with the provisions of Rule 428 under the Securities Act of 1933, as amended (the “Securities Act”), and the introductory note to Part I of Form S-8. The document(s) containing the information specified in Part I will be sent or given to participants in the equity plans covered by this Post-Effective Amendment as specified by Rule 428(b)(1) of the Securities Act.

## PART II

### INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

#### ITEM 3. INCORPORATION OF DOCUMENTS BY REFERENCE.

The following documents filed by the Registrant with the Securities and Exchange Commission (the “SEC”) are hereby incorporated by reference into this Registration Statement:

- The Registrant’s Annual Report on [Form 10-K](#) for the fiscal year ended March 31, 2022, filed with the SEC on June 10, 2022;
- The Registrant’s Quarterly Report on [Form 10-Q](#) for the quarterly period ended June 30, 2022, filed with the SEC on August 11, 2022;
- The information specifically incorporated by reference into the Registrant’s Annual Report on Form 10-K for the fiscal year ended March 31, 2022 from the Registrant’s revised definitive proxy statement on [Schedule 14A](#), filed with the SEC on September 22, 2022;
- The Registrant’s Current Reports on Form 8-K filed with the SEC on [September 6, 2022](#) and [October 14, 2022](#); and
- The description of the Registrant’s common stock set forth in the Registrant’s Registration Statement on [Form 8-A](#) (File No. 001-35996), filed with the SEC on July 26, 2016, including any amendments or reports filed for the purpose of updating such description.

All other reports and other documents subsequently filed by the Registrant pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), prior to the filing of a post-effective amendment which indicates that all securities offered hereby have been sold or which deregisters all securities then remaining unsold, shall be deemed to be incorporated by reference into this Registration Statement and to be a part of this Registration Statement from the date of the filing of such reports and documents, except as to any portion of any future annual or quarterly report to stockholders or document or current report furnished under Items 2.02 or 7.01 of Form 8-K that is not deemed filed under such provisions.

For the purposes of this Registration Statement, any statement contained in a document incorporated or deemed to be incorporated by reference herein shall be deemed to be modified or superseded to the extent that a statement contained herein or in any other subsequently filed document that also is or is deemed to be incorporated by reference herein modifies or supersedes such statement. Any such statement so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this Registration Statement.

You should rely only on the information provided or incorporated by reference in this Registration Statement or any related prospectus. The Registrant has not authorized anyone to provide you with different information. You should not assume that the information in this Registration Statement or any related prospectus is accurate as of any date other than the date on the front of the document.

You may contact the Registrant in writing or orally to request copies of the above-referenced filings, without charge (excluding exhibits to such documents unless such exhibits are specifically incorporated by reference into the information incorporated into this Registration Statement). Requests for such information should be directed to:

Organovo Holdings, Inc.  
11555 Sorrento Valley Rd., Suite 100  
San Diego, CA 92121  
(858) 224-1000  
Attn: Executive Chairman

**ITEM 4. DESCRIPTION OF SECURITIES.**

Not applicable.

**ITEM 5. INTERESTS OF NAMED EXPERTS AND COUNSEL.**

Not applicable.

**ITEM 6. INDEMNIFICATION OF DIRECTORS AND OFFICERS.**

Section 102 of the General Corporation Law of the State of Delaware (the "DGCL") permits a corporation to eliminate or limit the personal liability of directors of a corporation to the corporation or its stockholders for monetary damages for a breach of fiduciary duty as a director, except where the director breached his duty of loyalty to the corporation or its stockholders, failed to act in good faith, engaged in intentional misconduct or knowingly violated a law, authorized the payment of a dividend or approved a stock repurchase or redemption in violation of the DGCL or derived an improper personal benefit. The Registrant's certificate of incorporation, as amended, provides that no director of the Registrant shall be personally liable to it or its stockholders for monetary damages for any breach of fiduciary duty as a director, notwithstanding any provision of law imposing such liability, except to the extent that the DGCL prohibits the elimination or limitation of liability of directors for breaches of fiduciary duty.

Section 145 of the DGCL provides that a corporation has the power to indemnify a director, officer, employee or agent of the corporation, or a person serving at the request of the corporation for another corporation, partnership, joint venture, trust or other enterprise in related capacities against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by the person in connection with an action, suit or proceeding to which he or she was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding by reason of such position, if such person acted in good faith and in a manner he or she reasonably believed to be in or not opposed to the best interests of the corporation, and, in any criminal action or proceeding, had no reasonable cause to believe his or her conduct was unlawful, except that, in the case of actions brought by or in the right of the corporation, no indemnification shall be made with respect to judgments, fines and amounts paid in settlement in connection with such action, suit or proceeding or with respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the corporation unless and only to the extent that the Court of Chancery or other adjudicating court determines that, despite the adjudication of liability but in view of all of the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper. The Registrant's bylaws, as amended, provide that the Registrant will indemnify each person who was or is a party or threatened to be made a party to any threatened, pending or completed action, suit or proceeding (other than an action by or in the right of the Registrant) by reason of the fact that he or she is or was a director or officer of the Registrant, or is or was serving, at the Registrant's request as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise (all such persons being referred to as an "Indemnatee"), against expenses (including, attorneys' fees), judgments, fines, and amounts paid in settlement actually and reasonably incurred in connection with such action, suit or proceeding, if such Indemnatee acted in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the Registrant's best interests, and, with respect to any criminal action or proceeding, he or she had no reasonable cause to believe his or her conduct was unlawful. The Registrant's bylaws, as amended, also provide that the Registrant will indemnify any Indemnatee who was or is a party to an action or suit by or in the right of the Registrant to procure a judgment in the Registrant's favor by reason of the fact that the Indemnatee is or was, a director or officer, or is or was serving, or has agreed to serve, at the Registrant's request as a director, officer, employee or agent of another corporation, partnership, joint

venture, trust or other enterprise, against expenses (including, attorneys' fees) actually and reasonably incurred by such Indemnitee in connection with the defense or settlement of such action or suit, if the Indemnitee acted in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the Registrant's best interests, except that no indemnification shall be made with respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the Registrant, unless, and only to the extent, that the Court of Chancery or the court in which such action or suit was brought determines, despite the adjudication of liability but in view of all the circumstances, he or she is entitled to indemnification of such expenses which the Court of Chancery or such other court shall deem proper. Notwithstanding the foregoing, to the extent that any Indemnitee has been successful, on the merits or otherwise, he or she will be indemnified against expenses (including, attorneys' fees) actually and reasonably incurred in connection therewith. Expenses must be advanced to an Indemnitee under certain circumstances.

The Registrant has entered into indemnification agreements with each of its directors and executive officers that may be broader than the specific indemnification provisions contained in the DGCL. These indemnification agreements require the Registrant, among other things, to indemnify its directors and executive officers against liabilities that may arise by reason of their status or service. These indemnification agreements also require the Registrant to advance all expenses incurred by the directors and executive officers in investigating or defending any such action, suit or proceeding, subject to certain exceptions.

The Registrant's bylaws, as amended, provide that the Registrant may purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the Registrant or is or was serving at the request of the Registrant as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against any liability asserted against him or her in any such capacity, or arising out of his or her status as such, whether or not the Registrant would have the power to indemnify such person against such liability under the DGCL. The Registrant has obtained insurance under which, subject to the limitations of the insurance policies, coverage is provided to the Registrant's directors and executive officers against loss arising from claims made by reason of breach of fiduciary duty or other wrongful acts as a director or executive officer, including claims relating to public securities matters, and to the Registrant with respect to payments that may be made by the Registrant to these directors and executive officers pursuant to the Registrant's indemnification obligations or otherwise as a matter of law.

#### **ITEM 7. EXEMPTION FROM REGISTRATION CLAIMED.**

Not applicable.

#### **ITEM 8. EXHIBITS.**

<b>Exhibit Number</b>	<b>Description</b>
3.1	<a href="#"><u>Certificate of Incorporation of Organovo Holdings, Inc. (Delaware) (previously filed as Exhibit 3.1 to the Registrant's Current Report on Form 8-K, as filed with the SEC on February 3, 2012).</u></a>
3.2	<a href="#"><u>Certificate of Amendment of Certificate of Incorporation of Organovo Holdings, Inc. (incorporated by reference from Exhibit 3.1 to the Registrant's Current Report on Form 8-K, as filed with the SEC on July 27, 2018).</u></a>
3.3	<a href="#"><u>Certificate of Second Amendment of Certificate of Incorporation of Organovo Holdings, Inc. (incorporated by reference from Exhibit 3.1 to the Registrant's Current Report on Form 8-K, as filed with the SEC on August 17, 2020).</u></a>
3.4	<a href="#"><u>Bylaws of Organovo Holdings, Inc. (Delaware) (incorporated by reference from Exhibit 3.2 to the Registrant's Current Report on Form 8-K, as filed with the SEC on February 3, 2012).</u></a>
3.5	<a href="#"><u>Amendment to Organovo Holdings, Inc. Bylaws, dated October 10, 2019 (incorporated by reference from Exhibit 99.1 to the Registrant's Current Report on Form 8-K, as filed with the SEC on October 11, 2019).</u></a>

- 3.6 [Amendment to Bylaws of Organovo Holdings, Inc., dated September 29, 2021 \(incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K, as filed with the SEC on October 1, 2021\).](#)
- 4.1 [Organovo Holdings, Inc. Amended and Restated 2012 Equity Incentive Plan \(incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K, as filed with the SEC on October 6, 2021\).](#)
- 4.2 [Form of Stock Option Award Agreement under the 2012 Equity Incentive Plan \(incorporated by reference from Exhibit 10.16 to the Company's Current Report on Form 8-K, as filed with the SEC on February 13, 2012\).](#)
- 4.3 [Organovo Holdings, Inc. 2022 Equity Incentive Plan \(incorporated by reference from Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed with the SEC on October 14, 2022\).](#)
- 4.4 [Form of Global Stock Option Award Agreement under the Organovo Holdings, Inc. 2022 Equity Incentive Plan \(incorporated by reference from Exhibit 4.2 to the Registrant Registration Statement on Form S-8, as filed with the SEC on October 25, 2022\).](#)
- 4.5 [Form of Global Restricted Stock Unit Award Agreement under the Organovo Holdings, Inc. 2022 Equity Incentive Plan \(incorporated by reference from Exhibit 4.3 to the Registrant Registration Statement on Form S-8, as filed with the SEC on October 25, 2022\).](#)
- 5.1\* [Opinion of Paul Hastings LLP.](#)
- 23.1\* [Consent of Mayer Hoffman McCann P.C., Independent Registered Public Accounting Firm.](#)
- 23.2\* [Consent of Paul Hastings LLP \(included in Exhibit 5.1\).](#)
- 24.1\* [Power of Attorney is contained on the signature page.](#)

\* Filed herewith.

#### **ITEM 9. UNDERTAKINGS.**

(a) The Registrant hereby undertakes:

(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by Section 10(a)(3) of the Securities Act;

(ii) To reflect in the prospectus any facts or events arising after the effective date of this registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in this registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the SEC pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20 percent change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement; and

(iii) To include any material information with respect to the plan of distribution not previously disclosed in this registration statement or any material change to such information in this registration statement;

*Provided, however, that:*

(A) paragraphs (a)(1)(i) and (a)(1)(ii) do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the SEC by the Registrant pursuant to Section 13 or Section 15(d) of the Exchange Act that are incorporated by reference in this registration statement.

(2) That, for the purpose of determining any liability under the Securities Act, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial *bona fide* offering thereof.

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(b) The Registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the Registrant's annual report pursuant to Section 13(a) or Section 15(d) of the Exchange Act that is incorporated by reference in this registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial *bona fide* offering thereof.

(h) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

## SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8 and has duly caused this Post-Effective Amendment to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Diego, State of California, on October 25, 2022.

### Organovo Holdings, Inc.

By: /s/ Keith Murphy  
Name: Keith Murphy  
Title: Executive Chairman

## POWER OF ATTORNEY

**KNOW ALL PERSONS BY THESE PRESENTS**, that each person whose signature appears below constitutes and appoints Keith Murphy, Thomas Hess and Thomas Jurgensen, and each or any one of them, as his or her true and lawful attorneys-in-fact and agent, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or their or his or her substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, this Post-Effective Amendment has been signed by the following persons in the capacities and on the dates indicated.

SIGNATURE	TITLE	DATE
<u>/s/ Keith Murphy</u> Keith Murphy	Executive Chairman <i>(Principal Executive Officer)</i>	October 25, 2022
<u>/s/ Thomas Hess</u> Thomas Hess	President and Chief Financial Officer <i>(Principal Financial and Accounting Officer)</i>	October 25, 2022
<u>/s/ Adam K. Stern</u> Adam K. Stern	Director	October 25, 2022
<u>/s/ Douglas Cohen</u> Douglas Cohen	Director	October 25, 2022
<u>/s/ David Gobel</u> David Gobel	Director	October 25, 2022
<u>/s/ Vaidehi Joshi</u> Vaidehi Joshi	Director	October 25, 2022
<u>/s/ Alison Milhous</u> Alison Milhous	Director	October 25, 2022



October 25, 2022

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Organovo Holdings, Inc.  
11555 Sorrento Valley Rd., Suite 100  
San Diego, CA 92121

Re: Post-Effective Amendment No. 1 to Registration Statements on Form S-8

Ladies and Gentlemen:

We have acted as counsel to Organovo Holdings, Inc., a Delaware corporation (the "**Company**"), in connection with the Post-Effective Amendment No. 1 to Registration Statements on Form S-8 (the "**Post-Effective Amendment**") to be filed by the Company with the U.S. Securities and Exchange Commission (the "**Commission**") on or about the date hereof under the Securities Act of 1933, as amended (the "**Securities Act**"). The Post-Effective Amendment provides for the registration of up to a maximum of 1,367,722 shares (such Shares, the "**Carryover Shares**") of the Company's common stock, \$0.001 par value per share ("**Common Stock**"), which is a portion of the shares of Common Stock previously registered pursuant to the following registration statements, that may become available for issuance pursuant to the Company's 2022 Equity Incentive Plan (the "**2022 Plan**"):

- (1) the Registration Statement on Form S-8 (File No. 333-181324) filed on May 10, 2012, with respect to 327,699 shares of Common Stock to be issued under the Organovo Holdings, Inc. 2012 Equity Incentive Plan, as amended (the "**2012 Plan**");
- (2) the Registration Statement on Form S-8 (File No. 333-192248) filed on November 8, 2013, with respect to 250,000 shares of Common Stock to be issued under the 2012 Plan;
- (3) the Registration Statement on Form S-8 (File No. 333-209395) filed on February 4, 2016, with respect to 300,000 shares of Common Stock to be issued under the 2012 Plan;
- (4) the Registration Statement on Form S-8 (File No. 333-226839) filed on August 14, 2018, with respect to 550,000 shares of Common Stock to be issued under the 2012 Plan; and
- (5) the Registration Statement on Form S-8 (File No. 333-260910) filed on November 9, 2021, with respect to 900,000 shares of Common Stock to be issued under the 2012 Plan (the registration statements listed in (1) through (5) are referred to herein as the "**Registration Statements**").

All share amounts listed above have been adjusted to reflect the 1-for-20 reverse split of the Common Stock effected on August 18, 2020. The Carryover Shares will become available for issuance pursuant to the 2022 Plan to the extent that any such Carryover Shares are subject to awards previously granted under the 2012 Plan and, on or after October 12, 2022, such awards expire or otherwise terminate without having been exercised or issued in full or are forfeited to or repurchased by the Company due to failure to vest.

As such counsel and for purposes of our opinion set forth below, we have examined and relied upon originals or copies, certified or otherwise identified to our satisfaction, of such documents, resolutions, certificates and instruments of the Company and corporate records furnished to us by the Company, and have reviewed certificates of public officials, statutes, records and such other instruments and documents as we have deemed necessary or appropriate as a basis for the opinion set forth below, including, without limitation:

- (i) the Post-Effective Amendment;
- (ii) the Registration Statements;
- (iii) the Certificate of Incorporation of the Company, as amended, certified by the Office of the Secretary of State of the State of Delaware on October 25, 2022;
- (iv) the Bylaws of the Company, as amended, certified by an officer of the Company on October 25, 2022;
- (v) the 2012 Plan and the forms of award agreements related thereto;
- (vi) the 2022 Plan and the forms of award agreements related thereto;
- (vii) a certificate, dated as of October 25, 2022, from the Office of the Secretary of State of the State of Delaware, as to the existence and good standing of the Company in the State of Delaware (the “*Good Standing Certificate*”); and
- (viii) the resolutions adopted by the board of directors of the Company regarding the 2022 Plan and other matters related thereto, as certified by an officer of the Company on July 25, 2022.

In addition to the foregoing, we have made such investigations of law as we have deemed necessary or appropriate as a basis for the opinion set forth in this opinion letter.

In such examination and in rendering the opinion expressed below, we have assumed, without independent investigation or verification: (i) the genuineness of all signatures on all agreements, instruments, corporate records, certificates and other documents submitted to us; (ii) the authenticity and completeness of all agreements, instruments, corporate records, certificates and other documents submitted to us as originals; (iii) that all agreements, instruments, corporate records, certificates and other documents submitted to us as certified, electronic, facsimile, conformed, photostatic or other copies conform to originals thereof, and that such originals are authentic and complete; (iv) the legal capacity and authority of all persons or entities (other than the Company) executing all agreements, instruments, corporate records, certificates and other documents submitted to us; (v) the due authorization, execution and delivery of all agreements, instruments, corporate records, certificates and other documents by all parties thereto (other than the Company); (vi) that no documents submitted to us have been amended or terminated orally or in writing except as has been disclosed to us in writing; (vii) that the statements contained in the certificates and comparable documents of public officials, officers and representatives of the Company and other persons on which we have relied for the purposes of this opinion letter are true and correct; (viii) that there has not been any change in the good standing status of the Company from that reported in the Good Standing Certificate; and (ix) that each of the officers and directors of the Company has properly exercised his or her fiduciary duties. As to all questions of fact material to this opinion letter, and as to the materiality of any fact or other matter referred to herein, we have relied (without independent investigation or verification) upon

Organovo Holdings, Inc.

October 25, 2022

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representations and certificates or comparable documents of officers and representatives of the Company. Our knowledge of the Company and its legal and other affairs is limited by the scope of our engagement, which scope includes the delivery of this opinion letter. We do not represent the Company with respect to all legal matters or issues. The Company may employ other independent counsel and, to our knowledge, handles certain legal matters and issues without the assistance of independent counsel. We have also assumed that the individual issuances, grants, awards or grants of purchase rights under the 2022 Plan will be duly authorized by all necessary corporate action of the Company and duly issued, granted or awarded and exercised in accordance with the requirements of law, the 2022 Plan and the agreements, forms of instrument, awards and grants duly adopted thereunder.

Based upon the foregoing, and in reliance thereon, and subject to the assumptions, limitations, qualifications and exceptions set forth herein, we are of the opinion that the Carryover Shares are duly authorized and, when issued and sold as described in the Registration Statements, as amended by the Post-Effective Amendment, and in accordance with the 2022 Plan and the applicable award agreements or forms of instrument evidencing purchase rights thereunder (including the receipt by the Company of the full consideration therefor), will be validly issued, fully paid and nonassessable.

Without limiting any of the other limitations, exceptions and qualifications stated elsewhere herein, we express no opinion with regard to the applicability or effect of the laws of any jurisdiction other than the General Corporation Law of the State of Delaware, as in effect on the date of this opinion letter.

This opinion letter deals only with the specified legal issues expressly addressed herein, and you should not infer any opinion that is not explicitly stated herein from any matter addressed in this opinion letter.

This opinion letter is rendered solely in connection with the issuance and delivery of the Carryover Shares as described in the Post-Effective Amendment and in accordance with the terms of the 2022 Plan and the applicable award agreement or form of instrument evidencing purchase rights thereunder. This opinion letter is rendered as of the date hereof, and we assume no obligation to advise you or any other person with regard to any change after the date hereof in the circumstances or the law that may bear on the matters set forth herein even if the change may affect the legal analysis or a legal conclusion or other matters in this opinion letter.

We hereby consent to the filing of this opinion letter as Exhibit 5.1 to the Post-Effective Amendment. In giving such consent, we do not hereby admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the rules or regulations of the Commission thereunder.

Very truly yours,

/s/ Paul Hastings LLP

**Consent of Independent Registered Public Accounting Firm**

We consent to the incorporation by reference in this Post Effective Amendment No. 1 to the Registration Statements on Form S-8 (File Nos. 333-181324, 333-192248, 333-209395, 333-226839 and 333-260910) of our report dated June 10, 2022, with respect to the consolidated financial statements of Organovo Holdings, Inc. as of March 31, 2022 and 2021 and for each of the two years in the period ended March 31, 2022, included in its Annual Report on Form 10-K for the year ended March 31, 2022.

/s/ Mayer Hoffman McCann P.C.

San Diego, California  
October 25, 2022