# SECURITIES AND EXCHANGE COMMISSION
# Washington, D.C. 20549

## SCHEDULE 13G

UNDER THE SECURITIES EXCHANGE ACT OF 1934

**(Amendment No. 6)***

**TAYSHA GENE THERAPIES, INC.**

**(Name of Issuer)**

**Common Stock, $0.00001 par value per share**

**(Title of Class of Securities)**

**(CUSIP Number)**

**09/30/2026**

**(Date of Event Which Requires Filing of this Statement)**

Check the appropriate box to designate the rule pursuant to which this Schedule is filed:

- ☐ Rule 13d-1(b)
- ☑ Rule 13d-1(c)
- ☐ Rule 13d-1(d)

SCHEDULE 13G

**CUSIP No.**

| | |
|---|---|
| 1 | Names of Reporting Persons<br>RA Capital Management, L.P. |
| 2 | Check the appropriate box if a member of a Group (see instructions)<br>☐ (a)<br>☐ (b) |
| 3 | Sec Use Only |
| 4 | Citizenship or Place of Organization<br>DELAWARE |

| | | |
|---|---|---|
| Number of Shares Beneficially Owned by Each Reporting Person With: | 5 | Sole Voting Power<br>0.00 |
| | 6 | Shared Voting Power<br>32,785,574.00 |
| | 7 | Sole Dispositive Power<br>0.00 |
| | 8 | Shared Dispositive Power<br>32,785,574.00 |
| 9 | | Aggregate Amount Beneficially Owned by Each Reporting Person<br>32,785,574.00 |
| 10 | | Check box if the aggregate amount in row (9) excludes certain shares (See Instructions)<br>☐ |
| 11 | | Percent of class represented by amount in row (9)<br>9.9 % |
| 12 | | Type of Reporting Person (See Instructions)<br>IA, PN |

SCHEDULE 13G

**CUSIP No.**

| | | |
|---|---|---|
| 1 | | Names of Reporting Persons<br>Peter Kolchinsky |
| 2 | | Check the appropriate box if a member of a Group (see instructions)<br>☐ (a)<br>☐ (b) |
| 3 | | Sec Use Only |
| 4 | | Citizenship or Place of Organization<br>UNITED STATES |
| Number of Shares Beneficially Owned by Each Reporting Person With: | 5 | Sole Voting Power<br>0.00 |
| | 6 | Shared Voting Power<br>32,785,574.00 |
| | 7 | Sole Dispositive Power<br>0.00 |
| | 8 | Shared Dispositive Power<br>32,785,574.00 |
| 9 | | Aggregate Amount Beneficially Owned by Each Reporting Person<br>32,785,574.00 |
| 10 | | Check box if the aggregate amount in row (9) excludes certain shares (See Instructions)<br>☐ |

| | |
|---|---|
| 11 | Percent of class represented by amount in row (9)<br><br>9.9 % |
| 12 | Type of Reporting Person (See Instructions)<br><br>HC, IN |

SCHEDULE 13G

**CUSIP No.**

| | | |
|---|---|---|
| 1 | Names of Reporting Persons<br><br>Rajeev Shah | |
| 2 | Check the appropriate box if a member of a Group (see instructions)<br><br>☐ (a)<br>☐ (b) | |
| 3 | Sec Use Only | |
| 4 | Citizenship or Place of Organization<br><br>UNITED STATES | |
| Number of Shares Beneficially Owned by Each Reporting Person With: | 5 | Sole Voting Power<br><br>0.00 |
| | 6 | Shared Voting Power<br><br>32,785,574.00 |
| | 7 | Sole Dispositive Power<br><br>0.00 |
| | 8 | Shared Dispositive Power<br><br>32,785,574.00 |
| 9 | Aggregate Amount Beneficially Owned by Each Reporting Person<br><br>32,785,574.00 | |
| 10 | Check box if the aggregate amount in row (9) excludes certain shares (See Instructions)<br><br>☐ | |
| 11 | Percent of class represented by amount in row (9)<br><br>9.9 % | |
| 12 | Type of Reporting Person (See Instructions)<br><br>HC, IN | |

SCHEDULE 13G

**CUSIP No.**

| | |
|---|---|
| 1 | Names of Reporting Persons<br><br>RA Capital Healthcare Fund, L.P. |
| 2 | Check the appropriate box if a member of a Group (see instructions) |

☐ (a)
☐ (b)

3 Sec Use Only

4 Citizenship or Place of Organization

DELAWARE

Number of Shares Beneficially Owned by Each Reporting Person With:

5 Sole Voting Power

0.00

6 Shared Voting Power

32,785,574.00

7 Sole Dispositive Power

0.00

8 Shared Dispositive Power

32,785,574.00

9 Aggregate Amount Beneficially Owned by Each Reporting Person

32,785,574.00

10 Check box if the aggregate amount in row (9) excludes certain shares (See Instructions)

☐

11 Percent of class represented by amount in row (9)

9.9 %

12 Type of Reporting Person (See Instructions)

PN

## SCHEDULE 13G

Item 1.

(a) Name of issuer:

TAYSHA GENE THERAPIES, INC.

(b) Address of issuer's principal executive offices:

3000 PEGASUS PARK DRIVE, SUITE 1430, DALLAS, TX, 75247.

Item 2.

Name of person filing:

(a) The names of the persons filing this report (collectively, the "Reporting Persons") are: RA Capital Management, L.P. ("RA Capital") Peter Kolchinsky ("Dr. Kolchinsky") Rajeev Shah ("Mr. Shah") RA Capital Healthcare Fund, L.P. (the "Fund") The Reporting Persons expressly disclaim status as a "group" for purposes of this Schedule 13G/A.

(b) Address or principal business office or, if none, residence:

The address of the principal business office of each of the Reporting Persons is: c/o RA Capital Management, L.P., 200 Berkeley Street, 18th Floor, Boston MA 02116

(c) Citizenship:

RA Capital and the Fund are Delaware limited partnerships. Dr. Kolchinsky and Mr. Shah are United States citizens.

(d) Title of class of securities:

Common Stock, $0.00001 par value per share

(e) CUSIP No.:

Item 3. If this statement is filed pursuant to §§ 240.13d-1(b) or 240.13d-2(b) or (c), check whether the person filing is a:

(a) ☐ Broker or dealer registered under section 15 of the Act (15 U.S.C. 78o);

(b) ☐ Bank as defined in section 3(a)(6) of the Act (15 U.S.C. 78c);

(c) ☐ Insurance company as defined in section 3(a)(19) of the Act (15 U.S.C. 78c);

(d) ☐ Investment company registered under section 8 of the Investment Company Act of 1940 (15 U.S.C. 80a-8);

(e) ☐ An investment adviser in accordance with § 240.13d-1(b)(1)(ii)(E);

(f) ☐ An employee benefit plan or endowment fund in accordance with § 240.13d-1(b)(1)(ii)(F);

(g) ☐ A parent holding company or control person in accordance with § 240.13d-1(b)(1)(ii)(G);

(h) ☐ A savings associations as defined in Section 3(b) of the Federal Deposit Insurance Act (12 U.S.C. 1813);

(i) ☐ A church plan that is excluded from the definition of an investment company under section 3(c)(14) of the Investment Company Act of 1940 (15 U.S.C. 80a-3);

(j) ☐ A non-U.S. institution in accordance with § 240.13d-1(b)(1)(ii)(J). If filing as a non-U.S. institution in accordance with § 240.13d-1(b)(1)(ii)(J), please specify the type of institution:

(k) ☐ Group, in accordance with Rule 240.13d-1(b)(1)(ii)(K).

Item 4. Ownership

Amount beneficially owned:

(a) Row 9 of each Reporting Person's cover page to this Schedule 13G/A sets forth the aggregate number of shares of common stock of the Issuer beneficially owned by such Reporting Person as of September 30, 2026 and is incorporated by reference. The Fund directly holds 30,435,190 shares of common stock and pre-funded warrants ("Pre-Funded Warrants") exercisable for up to 52,134,718 shares of common stock. The Pre-Funded Warrants contain a provision (the "Beneficial Ownership Blocker"), which precludes the exercise of the Pre-Funded Warrants to the extent that, following exercise, the Fund, together with its affiliates and other attribution parties, would own more than 9.99% of the common stock outstanding. The Fund is currently prohibited from exercising a portion of the Pre-Funded Warrants to the extent that such exercise would result in beneficial ownership of more than 32,785,574 shares of common stock. RA Capital Healthcare Fund GP, LLC is the general partner of the Fund. The general partner of RA Capital is RA Capital Management GP, LLC, of which Dr. Kolchinsky and Mr. Shah are the controlling persons. RA Capital serves as investment adviser for the Fund and may be deemed a beneficial owner, for purposes of Section 13(d) of the Act, of any securities of the Issuer held by the Fund. The Fund has delegated to RA Capital the sole power to vote and the sole power to dispose of all securities held in the Fund's portfolio, including the shares of the Issuer's Common Stock reported herein. Because the Fund has divested voting and investment power over the reported securities it holds and may not revoke that delegation on less than 61 days' notice, the Fund disclaims beneficial ownership of the securities it holds for purposes of Section 13(d) of the Act. As managers of RA Capital, Dr. Kolchinsky and Mr. Shah may be deemed beneficial owners, for purposes of Section 13(d) of the Act, of any securities of the Issuer beneficially owned by RA Capital. RA Capital, Dr. Kolchinsky, and Mr. Shah disclaim beneficial ownership of the securities reported in this Schedule 13G/A other than for the purpose of determining their obligations under Section 13(d) of the Act, and the filing of this Schedule 13G/A shall not be deemed an admission that either RA Capital, Dr. Kolchinsky, or Mr. Shah is the beneficial owner of such securities for any other purpose.

Percent of class:

(b) Due to the Beneficial Ownership Blocker listed in the Pre-Funded Warrants, each Reporting Person's beneficial ownership percentage as of September 30, 2026 was 9.99%. Such percentage is based upon 325,833,545 shares of the Issuer's common stock outstanding as of August 11, 2026, as reported in the Issuer's Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission (the "SEC") on August 11, 2026, and giving effect to Pre-Funded Warrants, to the extent exercisable within 60 days hereof, as referenced herein. Due to field limitations of the EDGAR filing system, the percentage listed in Row 11 of each Reporting Person's cover page has been rounded down to 9.9%. %

(c) Number of shares as to which the person has:

(i) Sole power to vote or to direct the vote:

Row 5 of each Reporting Person's cover page to this Schedule 13G/A sets forth the sole power to vote or to direct the vote of securities of the Issuer beneficially owned by such Reporting Person as of September 30, 2026 and is incorporated by reference.

(ii) Shared power to vote or to direct the vote:

Row 6 of each Reporting Person's cover page to this Schedule 13G/A sets forth the shared power to vote or to direct the vote of securities of the Issuer beneficially owned by such Reporting Person as of September 30, 2026 and is incorporated by reference.

(iii) Sole power to dispose or to direct the disposition of:

Row 7 of each Reporting Person's cover page to this Schedule 13G/A sets forth the sole power to dispose or to direct the disposition of securities of the Issuer beneficially owned by such Reporting Person as of September 30, 2026 and is incorporated by reference.

(iv) Shared power to dispose or to direct the disposition of:

Row 8 of each Reporting Person's cover page to this Schedule 13G/A sets forth the shared power to dispose or to direct the disposition of securities of the Issuer beneficially owned by such Reporting Person as of September 30, 2026 and is incorporated by reference.

Item 5. Ownership of 5 Percent or Less of a Class.

Item 6. Ownership of more than 5 Percent on Behalf of Another Person.

Not Applicable

Item 7. Identification and Classification of the Subsidiary Which Acquired the Security Being Reported on by the Parent Holding Company or Control Person.

Not Applicable

Item 8. Identification and Classification of Members of the Group.

Not Applicable

Item 9. Notice of Dissolution of Group.

Not Applicable

Item 10. Certifications:

By signing below I certify that, to the best of my knowledge and belief, the securities referred to above were not acquired and are not held for the purpose of or with the effect of changing or influencing the control of the issuer of the securities and were not acquired and are not held in connection with or as a participant in any transaction having that purpose or effect, other than activities solely in connection with a nomination under § 240.14a-11.

SIGNATURE

After reasonable inquiry and to the best of my knowledge and belief, I certify that the information set forth in this statement is true, complete and correct.

RA Capital Management, L.P.

Signature: /s/ Peter Kolchinsky
Name/Title: By Peter Kolchinsky, Authorized Signatory
Date: 11/16/2026

Peter Kolchinsky

Signature: /s/ Peter Kolchinsky
Name/Title: Peter Kolchinsky
Date: 11/16/2026

Rajeev Shah

Signature: /s/ Rajeev Shah
Name/Title: Rajeev Shah
Date: 11/16/2026

RA Capital Healthcare Fund, L.P.

Signature: /s/ Peter Kolchinsky
Name/Title: By RA Capital Healthcare Fund GP, LLC, its General Partner, By Peter Kolchinsky, Manager
Date: 11/16/2026

**Exhibit Information**

Exhibit 99.1 Joint Filing Agreement (incorporated by reference to Exhibit 1 to the Reporting Persons' Schedule 13G/A filed with the SEC on November 14, 2024).