Filed pursuant to Rule 424(b)(3)
Registration Statement No. 333-239356

PROSPECTUS SUPPLEMENT NO. 6
(TO PROSPECTUS DATED July 10, 2020)

STEALTH BIOTHERAPEUTICS CORP

Up to 9,826,321 American Depositary Shares

This prospectus supplement No. 6 supplements and amends the prospectus dated July 10, 2020, as supplemented by prospectus supplement No.1, dated August 6, 2020, prospectus supplement No. 2, dated November 9, 2020, prospectus supplement No. 3, dated November 19, 2020, prospectus supplement No. 4, dated April 6, 2021, and prospectus supplement No. 5, dated October 4, 2021 related to the resale, from time to time, of up to 9,826,321 American Depositary Shares ("ADSs"), par value $0.0003 per share, of Stealth BioTherapeutics Corp (the "Company," "we," "us" or "our"), issued and issuable to Lincoln Park Capital Fund, LLC ("Lincoln Park"), the selling stockholder named in the prospectus, pursuant to a purchase agreement dated as of June 2, 2020 that we entered into with Lincoln Park. We are not selling any securities under this prospectus and will not receive any of the proceeds from the sale of the ADSs by the selling stockholder.

This prospectus supplement should be read in conjunction with the prospectus dated July 10, 2020, which is to be delivered with this prospectus supplement. This prospectus supplement is qualified by reference to the prospectus except to the extent that the information in this prospectus supplement supersedes the information contained in the prospectus. This prospectus supplement is not complete without, and may not be delivered or utilized except in connection with, the prospectus, including any amendments or supplements to it.

Our ADSs are listed on The Nasdaq Global Market under the symbol "MITO." On October 19, 2021, the last reported sale price of our ADSs reported on The Nasdaq Global Market was $1.38.

This prospectus supplement incorporates into our prospectus the information contained in our Report of Foreign Private Issuer on Form 6-K filed with the Securities and Exchange Commission on October 20, 2021, which is attached hereto.

Investing in our ADSs involves risks. See "Risk Factors" beginning on page 4 of the prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus supplement or the prospectus to which it relates are truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus supplement is October 20, 2021.

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

FORM 6-K

REPORT OF FOREIGN PRIVATE ISSUER
PURSUANT TO RULE 13a-16 OR 15d-16
UNDER THE SECURITIES EXCHANGE ACT OF 1934

For the month of October 2021

Commission File Number 001-38810

STEALTH BIOTHERAPEUTICS CORP

(Translation of registrant's name into English)

Stealth BioTherapeutics Corp
c/o Intertrust Corporate Services (Cayman) Limited
One Nexus Way, Camana Bay
Grand Cayman
KY1-9005 Cayman Islands
(Address of principal executive office)

Indicate by check mark whether the registrant files or will file annual reports under cover of Form 20-F or Form 40-F:

FORM 20-F ☒ FORM 40-F ☐

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(1): ☐

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(7): ☐

INCORPORATION BY REFERENCE

This report on Form 6-K shall be deemed to be incorporated by reference into the registration statements on Form S-8 (Registration Numbers 333-253601, 333-237541 and 333-230452) and Form F-3 (Registration Number 333-237542) of Stealth BioTherapeutics Corp (the "Company") (including any prospectuses forming a part of such registration statements) and to be a part thereof from the date on which this report is filed, to the extent not superseded by documents or reports subsequently filed or furnished.

On October 18, 2021, Stealth BioTherapeutics Corp (the “Company”) received a Refusal to File letter from the U.S. Food and Drug Administration (the “FDA”) regarding the Company’s new drug application (the “NDA”) for elamipretide, a mitochondria-targeted therapy for the treatment of Barth syndrome. The FDA determined, upon its preliminary review, that the NDA was not sufficiently complete to permit a substantive review. In the letter, the FDA stated that the NDA does not contain an adequate and well-controlled trial that provides evidence of effectiveness, noting that the SPIBA-201 Phase 2 clinical trial of elamipretide for the treatment of Barth syndrome was negative during the randomized, double-blind portion of the study and that the FDA does not consider the open label extension of the SPIBA-201 trial to be adequate and well-controlled.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

STEALTH BIOTHERAPEUTICS CORP

By: /s/ Irene P. McCarthy
Irene P. McCarthy
Chief Executive Officer

Date: October 20, 2021