

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

FORM 11-K

FOR ANNUAL REPORTS OF
EMPLOYEE STOCK PURCHASE, SAVINGS AND SIMILAR PLANS
PURSUANT TO SECTION 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934

(MARK ONE)

S ANNUAL REPORT PURSUANT TO SECTION 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
FOR THE FISCAL YEAR ENDED DECEMBER 31, 2012

OR

£ TRANSITION REPORT PURSUANT TO SECTION 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

FOR THE TRANSITION PERIOD FROM _____ TO _____

COMMISSION FILE NUMBER 001-09974

Enzo Biochem, Inc.
Salary Reduction Profit Sharing Plan

(Full title of the plan and the address of the plan,
if different from that of the issuer named below:)

Enzo Biochem, Inc. 527 Madison Ave. New York, NY 10022

(Name of issuer of the securities held pursuant to the plan and
the address of its principal executive office)

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Trustees and Participants of
Enzo Biochem, Inc. Salary Reduction Profit Sharing Plan

We have audited the accompanying statements of net assets available for benefits of Enzo Biochem, Inc. Salary Reduction Profit Sharing Plan (the "Plan") as of December 31, 2012 and 2011, and the related statement of changes in net assets available for benefits for the year ended December 31, 2012. The financial statements are the responsibility of the Plan's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. The Plan is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. Our audits included consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Plan's internal control over financial reporting. Accordingly, we express no such opinion. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above, present fairly, in all material respects, the net assets available for benefits of the Plan as of December 31, 2012 and 2011, and the changes in net assets available for benefits for the year ended December 31, 2012 in conformity with accounting principles generally accepted in the United States of America.

Our audits were performed for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplemental schedule of assets (held at end of year) as of December 31, 2012 is presented for the purpose of additional analysis and is not a required part of the basic financial statements but is supplemental information required by the Department of Labor's Rules and Regulations for Reporting and Disclosure under the Employee Retirement Income Security Act of 1974. The supplemental schedule is the responsibility of the Plan's management. The supplemental schedule has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

/s/ EisnerAmper LLP

New York, New York
July 3, 2013

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN

Statements of Net Assets Available for Benefits

December 31,

| | <u>2012</u> | <u>2011</u> |
|--|----------------------|----------------------|
| ASSETS | | |
| Investments, at fair value: | | |
| Mutual funds | \$ 15,438,382 | \$ 13,608,896 |
| Enzo Biochem, Inc. common stock | 1,653,542 | 1,109,214 |
| | <u>17,091,924</u> | <u>14,718,110</u> |
| Receivables: | | |
| Employer's contributions | 642,953 | 655,249 |
| Participants' contributions | — | 58 |
| Notes receivable – participants | 392,693 | 400,949 |
| | <u>1,035,646</u> | <u>1,056,256</u> |
| TOTAL ASSETS | <u>18,127,570</u> | <u>15,774,366</u> |
| NET ASSETS AVAILABLE FOR BENEFITS | <u>\$ 18,127,570</u> | <u>\$ 15,774,366</u> |

See notes to financial statements.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN

Statement of Changes in Net Assets Available for Benefits

For the Year Ended December 31, 2012

| | |
|---|----------------------|
| Additions to net assets attributed to: | |
| Investment income: | |
| Interest and dividends | \$ 401,331 |
| Net appreciation in fair value of investments and net gain on sale of investments | 1,398,708 |
| Interest on notes receivable-participants | 20,732 |
| Contributions: | |
| Participants' contributions | 2,065,025 |
| Employer's contributions | 643,253 |
| Total additions | <u>4,529,049</u> |
| Deductions from net assets attributed to: | |
| Benefits paid to participants | 2,151,740 |
| Administrative expenses | 24,105 |
| Total deductions | <u>2,175,845</u> |
| Net increase in net assets available for benefits | 2,353,204 |
| Net assets available for plan benefits, beginning of year | <u>15,774,366</u> |
| Net assets available for plan benefits, end of year | <u>\$ 18,127,570</u> |

See notes to financial statements.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 1: PLAN DESCRIPTION

The following description of the Enzo Biochem, Inc. Salary Reduction Profit Sharing Plan (“the Plan”) provides only general information. Participants should refer to the Plan Agreement, as amended, for a more complete description of the Plan’s provisions.

General

The Plan is a defined contribution plan covering all eligible United States based full-time employees who have completed one month of service and have attained age twenty-one of Enzo Biochem, Inc., (the “Plan Sponsor”), and its wholly owned subsidiaries, Enzo Clinical Labs, Inc., Enzo Therapeutics, Inc., and Enzo Life Sciences, Inc. (collectively, the “Company”). The Plan is subject to the provisions of the Employee Retirement Income Security Act of 1974 (“ERISA”).

Contributions

Eligible employee participants can elect to defer up to the maximum amount permitted by the Internal Revenue Code (the “Code”) for each year (\$17,000 in 2012 and \$16,500 in 2011). Catch-up contributions are also permitted for participants who have attained age 50 by December 31st, in accordance with Section 414(v) of the Code, in an amount up to a maximum of \$5,500 in 2012 and 2011, bringing those participants’ statutory maximum limitation to \$22,500 in 2012 and \$22,000 in 2011. In 2012, participant contributions totaled \$2,065,025 which includes \$304,918 in rollover contributions.

The Company may contribute to the Plan annually, a discretionary matching contribution. For 2012 the contribution was equal to 50% of the participant’s 401(k) contribution, not to exceed 50% of 10% of the participant’s annual compensation. Participants who have completed a year of service during the plan year and are actively employed as of the last day of the plan year shall be deemed eligible to share in the matching contribution for the year. In 2012, the total matching contributions were \$643,253 in the form of Enzo Biochem Inc. common stock.

The Plan provides that unless the participant affirmatively elects otherwise, the participant’s compensation will automatically be reduced by 3%, which will be considered to be the Participant’s salary reduction election.

Participant Accounts

Participants direct their contributions into various investment options offered by the Plan which include a choice of mutual funds and the common stock of Enzo Biochem, Inc. Contribution selections are designated by the participants. Each participant’s account is credited with the participant’s contribution and allocations of (a) the Company’s matching contribution, (b) Plan earnings and c) charged with an allocation of administrative expenses. Allocations are based on participant compensation or account balances, as defined. The benefit to which a participant is entitled is the benefit that can be provided from the participant’s vested account.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 1: PLAN DESCRIPTION (continued)

The Plan allows a participant to elect to classify all or part of his or her elective deferrals as a Roth 401(k) deferral.

Vesting

Participants' contributed funds arising from salary reductions and the earnings thereon, are fully vested at all times. Vesting in the Company's matching contribution and earnings thereon, are ratable over four years of service.

Forfeitures

Forfeited non-vested amounts are applied to reduce the Company's future contributions to the Plan and pay Plan expenses. During the year ended December 31, 2012, forfeitures of \$12,625 were used to reduce employer contributions and pay Plan expenses. Forfeited non-vested accounts available at December 31, 2012 and 2011, were \$26,032 and \$21,733, respectively.

Notes Receivable from Participants

Notes receivable from participants are measured at their unpaid principal balance plus any accrued but unpaid interest. Participants may borrow from their accounts a minimum of \$1,000 up to a maximum of 50% of their vested account balance or \$50,000. Participants are entitled to borrow from their account for a maximum loan term of five years unless the proceeds are used to acquire a principal residence in which case it may exceed five years. The loans, classified as Notes Receivable from Participants, are secured by the participant's vested account balance and bear a reasonable rate of interest, ranging from 4.50% to 9.25%. Principal and interest is paid ratably through payroll deductions. Delinquent notes receivable from participants are reclassified as distributions based upon the terms of the Plan document.

Payment of Benefits

On termination of service due to death, disability or retirement, participants may elect to receive an amount equal to the value of the vested interest in their account in either a lump sum amount or in various annuity options. For termination of service due to other reasons, a participant may receive the value of the vested interest in their account as a lump sum distribution. Benefits are payable in the form of cash or property.

Plan Expenses

Certain operating expenses including, among others, professional fees of the Plan, are paid by the Plan Sponsor. As noted above, certain administrative expenses were paid by the Plan from the forfeitures.

NOTE 2: SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Accounting

The Plan's financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America and under the accrual basis method of accounting. Benefits are recorded when paid.

Use of Estimates

The preparation of the financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect reported amounts of net assets available for benefits at the date of the financial statements and the accompanying footnotes and the changes in net assets available for benefits during the reporting period and when applicable disclosures of contingent assets and liabilities at the date of the financial statements. Actual results could differ from those estimates.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 2: SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Investment Valuation and Income Recognition

The Plan's investments are stated at fair value. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. See Note 3 for discussion of fair value measurements.

Interest income is recorded on the accrual basis. Dividends are recorded on the ex-dividend date. Investment earnings are reinvested in the respective funds. Investment earnings include the Plan's proportionate share of realized gains and losses on the disposal of investments, and appreciation or depreciation in the fair value of the underlying investments comprising the respective mutual funds. All purchases and sales are recorded on a trade date basis.

The Plan presents in the statement of changes in net asset available for benefits, the net appreciation in fair value of its investments, which consists of the realized gains or losses and the unrealized appreciation on those investments.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 3: FAIR VALUE MEASUREMENTS

FASB's ASC 820, *Fair Value Measurements and disclosures*, provides a framework for measuring fair value. That framework provides a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (level 1 measurement) and the lowest priority to unobservable inputs (level 3 measurement). The three levels of the fair value hierarchy under ASC 820 are described as follows:

Level 1 - Inputs to the valuation methodology are unadjusted quoted prices for identical assets or liabilities in active markets that the Plan has the ability to access.

Level 2 - Inputs to the valuation methodology include: quoted prices for similar assets or liabilities in active markets; quoted prices for identical or similar assets or liabilities in inactive markets; inputs other than quoted prices that are observable for the assets or liability; inputs that are derived principally from or corroborated by observable market data by correlation or other means.

If the asset or liability has a specified (contractual) term, the level 2 Input must be observable for substantially the full term of the asset or liability.

Level 3 - Inputs to the valuation methodology are unobservable and significant to the fair value measurements.

The asset or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques used need to maximize the use of observable inputs and minimize the use of unobservable inputs.

In 2012, the Plan adopted Financial Accounting Standards Board ("FASB") Accounting Standards Update ("ASU") No. 2011-04, Amendments to Achieve Common Fair Value Measurement and Disclosure Requirements in U.S. GAAP and IFRSs (ASU 2011-04), effective for Plan years beginning after December 15, 2011. ASU 2011-04 amends Accounting Standards Codification ("ASC") 820 to converge the fair value measurement guidance in U.S. generally accepted accounting principles ("GAAP") and International Financial Reporting Standards ("IFRSs"). Adoption of ASU 2011-04 had no effect on the financial statements.

Following is a description of the valuation methodologies used for assets measured at fair value. There have been no changes in the methodologies used at December 31, 2012 and 2011.

Mutual funds – Valued at the daily closing price as reported by the fund. Mutual funds held by the Plan are open-ended mutual funds that are registered with the Securities and Exchange Commission. These funds are required to publish their daily net asset value ("NAV") and to transact at that price. The mutual funds held by the Plan are deemed to be actively traded.

Common stocks – Valued at the closing price reported on the active market on which the individual securities are traded.

The methods described may produce a fair value calculation that may not be indicative of net realizable value or reflective of future fair values. Furthermore, although the Plan believes its valuation methods are appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 3: FAIR VALUE MEASUREMENTS (continued)

The following tables sets forth by level, within the fair value hierarchy, the Plan's investments as of December 31:

| | Assets at Fair Value as of | |
|---------------------------------|----------------------------|----------------------|
| | December 31, 2012 | December 31, 2011 |
| | Level 1 | Level 1 |
| Mutual funds | | |
| Mid/large cap stock | \$ 12,684,033 | \$ 10,930,017 |
| Money market | 478,690 | 616,445 |
| Fixed income | 986,708 | 1,000,945 |
| International | 630,187 | 488,505 |
| Small cap stock | 658,764 | 572,984 |
| | <u>\$ 15,438,382</u> | <u>\$ 13,608,896</u> |
| Common stock-Enzo Biochem, Inc. | <u>1,653,542</u> | <u>1,109,214</u> |
| | <u>\$ 17,091,924</u> | <u>\$ 14,718,110</u> |

Changes in Fair Value Levels

The availability of observable market data is monitored to assess the appropriate classification of financial instruments within the fair value hierarchy. Changes in economic conditions or model-based valuation techniques may require the transfer of financial instruments from one fair value level to another. In such instances, the transfer is reported at the beginning of the reporting period. The Plan's investments consist of only level 1 investments and there were no transfers between levels.

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 4: INVESTMENTS

The following table presents fair values, as determined by quoted market price, of the investments representing 5% or more of total net assets at December 31:

| | <u>2012</u> | <u>2011</u> |
|---|--------------|--------------|
| Enzo Biochem, Inc. (612,423 shares at 2012, 495,185 shares at 2011) | \$ 1,653,542 | \$ 1,109,214 |
| Fidelity Contrafund | 1,099,048 | 873,400 |
| Fidelity Freedom 2010 | 960,602 | 865,310 |
| Fidelity Freedom 2020 | 2,343,779 | 1,932,206 |
| Fidelity Freedom 2030 | 1,747,732 | 1,403,639 |
| Fidelity Freedom 2015 | 1,792,436 | 1,566,288 |
| Fidelity Freedom 2025 | 1,754,554 | 1,531,404 |

ENZO BIOCHEM, INC.
SALARY REDUCTION PROFIT SHARING PLAN
Notes to Financial Statements

NOTE 4: INVESTMENTS (continued)

During the year ended December 31, 2012, the Plan's investments (including gains and losses on investments bought and sold, as well as held during the year) appreciated in value by \$1,398,708 as follows:

| | |
|--------------|---------------------|
| Mutual funds | \$ 1,267,178 |
| Common stock | <u>131,530</u> |
| | <u>\$ 1,398,708</u> |

NOTE 5: RIGHT TO TERMINATE PLAN

Although it has not expressed any intent to do so, the Company has the right under the Plan to discontinue its contributions at any time and to terminate the Plan subject to the provisions of ERISA.

NOTE 6: TAX STATUS

The Plan adopted the Corporate Plan for Retirement, a Fidelity Management and Research Company prototype plan. The Plan obtained its latest opinion letter in March 2008 in which the Internal Revenue Service stated that the Plan was in compliance with the applicable requirements of the Internal Revenue Code. The Plan has been amended since receiving the opinion letter. However, the plan administrator believes that the Plan is currently designed and being operated in compliance with the applicable requirements of the Internal Revenue Code.

Accounting principles generally accepted in the United States of America require plan management to evaluate tax positions taken by the Plan and recognize a tax liability (or asset) if the plan has taken an uncertain position that more likely than not would not be sustained upon examination by a government authority. The plan administrator has analyzed the tax positions taken by the Plan, and has concluded that as of December 31, 2012, there are no uncertain positions taken or expected to be taken that would require recognition of a liability (or asset) or disclosure in the financial statements. The Plan is subject to routine audits by taxing jurisdictions; however, there are currently no audits for any tax periods in progress. The plan administrator believes it is no longer subject to income tax examinations for years prior to 2009.

NOTE 7: PARTY IN INTEREST TRANSACTIONS

During 2012, the Plan purchased 258,452 shares of common stock of the Plan sponsor, at market prices totaling \$710,688 and sold 141,214 shares of common stock at market prices totaling approximately \$297,887. At December 31, 2012 and 2011, the Plan held Enzo Biochem, Inc. common stock with a fair value of \$1,653,542 and \$1,109,214, respectively.

Fidelity Management Trust Company ("FMTC") is the trustee of the Plan. Certain Plan investments are shares of mutual funds managed by affiliates of FMTC. Therefore, these transactions qualify as party-in-interest transactions. Fees paid by the Plan for the investment management services are included in net appreciation in fair value of investments.

Fees paid by the Plan to FMTC amounted to \$12,625 for the year ended December 31, 2012.

NOTE 8: RISKS AND UNCERTAINTIES

The Plan invests in various investment securities. Investment securities are exposed to various risk such as interest rate, market, and credit risks. Due to the level of risk associated with certain investment securities, it is at least reasonably possible that changes in the values of investment securities will occur in the near term and that such changes could materially affect participants' account balances and the amounts reported in the statements of net assets available for benefits.

Users of these financial statements should be aware that the financial markets' volatility may significantly impact the subsequent valuation of the Plan's investments. Accordingly, the valuation of investments at December 31, 2012 may

not necessarily be indicative of amounts that could be realized in a current market exchange.

NOTE 9: MUTUAL FUND FEES

Investments in mutual funds are subject to sales charges in the form of front-end loads, back-end loads or 12b-1 fees. 12b-1 fees, which are ongoing fees allowable under Section 12b-1 of the Investment Company Act of 1940, are annual fees deducted to pay for marketing and distribution costs of the funds. These fees are deducted prior to the allocation of the Plan's investment earnings activity, and thus not separately identifiable as an expense.

ENZO BIOCHEM, INC.
SALARY REDUCTION PLAN
Schedule H, Line 4i
Schedule of Assets (Held at End of Year)
E.I.N. # 13-2866202
Plan # 001
December 31, 2012

| (a) | Identity of Issue, Borrower, Lessor or Similar Party (b) | Description of Investment Including Maturity Date, Rate of Interest, Collateral, Par or Maturity Value (c) | Cost** (d) | Current Value (e) |
|-----|---|---|---------------|-------------------------|
| * | Enzo Biochem, Inc. | Common Stock | | \$ 1,653,542 |
| | Pimco Total Return | Mutual Fund | | 322,112 |
| | MSIFT Mid Cap Growth Portfolio | Mutual Fund | | 152,350 |
| | NB Genesis | Mutual Fund | | 500,421 |
| | Allianz NFJ Dividend Value | Mutual Fund | | 117,662 |
| | Columbia Acorn International Select | Mutual Fund | | 293,056 |
| | Allianz NFJ Small Cap Value | Mutual Fund | | 158,343 |
| | Royce Value Plus | Mutual Fund | | 80,594 |
| * | Fidelity Fund | Mutual Fund | | 163,748 |
| * | Fidelity Contrafund | Mutual Fund | | 1,099,048 |
| * | Fidelity Capital & Income | Mutual Fund | | 144,174 |
| * | Fidelity Government Income | Mutual Fund | | 278,267 |
| * | Fidelity Leveraged Company | Mutual Fund | | 63,597 |
| * | Fidelity International Discovery | Mutual Fund | | 97,740 |
| * | Fidelity Emerging Markets | Mutual Fund | | 127,923 |
| * | Fidelity Growth Discovery | Mutual Fund | | 117,990 |
| * | Fidelity Freedom Income | Mutual Fund | | 95,335 |
| * | Fidelity Freedom 2000 | Mutual Fund | | 17,342 |
| * | Fidelity Freedom 2010 | Mutual Fund | | 960,602 |
| * | Fidelity Freedom 2020 | Mutual Fund | | 2,343,779 |
| * | Fidelity Freedom 2030 | Mutual Fund | | 1,747,732 |
| * | Spartan Extended Market Index | Mutual Fund | | 205,369 |
| * | Spartan International Index | Mutual Fund | | 111,467 |
| * | Fidelity Retirement Money Market | Mutual Fund | | 162,488 |
| * | Fidelity Retirement Government Money Market | Mutual Fund | | 316,203 |
| * | Spartan 500 Equity Index | Mutual Fund | | 494,873 |
| * | Fidelity Freedom 2040 | Mutual Fund | | 540,031 |
| * | Fidelity Freedom 2005 | Mutual Fund | | 129,478 |
| * | Fidelity Freedom 2015 | Mutual Fund | | 1,792,436 |
| * | Fidelity Freedom 2025 | Mutual Fund | | 1,754,554 |
| * | Fidelity Freedom 2035 | Mutual Fund | | 576,167 |
| * | Fidelity Freedom 2045 | Mutual Fund | | 342,187 |
| * | Fidelity Freedom 2050 | Mutual Fund | | 109,387 |
| * | Fidelity Freedom 2055 | Mutual Fund | | 20,944 |
| * | Fidelity Cash Reserves | Mutual Fund | | 983 |
| * | Notes receivable - participants | 4.5% -9.25% | \$ 0 | 392,693 |
| | | Maturity through December 2017 | | \$ 17,484,617 |

* Party-in-interest

**Cost information omitted with respect to participant or beneficiary directed transactions.

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, a trustee of the below named employee benefit plan has duly caused this annual report to be signed on its behalf by the undersigned hereunto duly authorized.

Enzo Biochem, Inc. Salary Reduction Profit Sharing Plan

Date: July 3, 2013

/s/ Andrew R.Crescenzo

By: Andrew R.Crescenzo
Trustee