

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

SCHEDULE 13D
(Amendment No. 4)

Under the Securities Exchange Act of 1934

LEXICON GENETICS INCORPORATED

(Name of Issuer)

Common Stock \$0.001 Par Value Per Share

(Title of Class of Securities)

528872 10 4

(CUSIP Number)

**Mr. John Sullivan
Gordon Cain and Associates
8 Greenway Plaza, Suite 702
Houston, Texas 77046
Telephone: (713) 840-7896**

(Name, Address and Telephone Number of Person Authorized to Receive Notices and Communications)

July 26, 2005

(Date of Event which Requires Filing of this Statement)

If the filing person has previously filed a statement on Schedule 13G to report the acquisition that is the subject of this Schedule 13D, and is filing this Schedule because of Rule 13d-1(e), Rule 13d-1(f) or Rule 13d-1(g), check the following box:

The information required on the remainder of this cover page shall not be deemed to be "filed" for the purpose of Section 18 of the Securities Exchange Act of 1934 ("Act") or otherwise subject to the liabilities of that section of the Act but shall be subject to all other provisions of the Act.

1 Name of Reporting Person

Estate of Gordon A. Cain (01-6222478)

2 Check the Appropriate Box If A Member of a Group

(a)

(b)

3 SEC Use Only

4 Source of Funds

OO

5 Check Box If Disclosure of Legal Proceedings Is Required Pursuant to Item 2(d) or 2(e)

6 Citizenship or Place of Organization

Texas

7 Sole Voting Power

0

8 Shared Voting Power

0

9 Sole Dispositive Power

0

10 Shared Dispositive Power

0

11 Aggregate Amount Beneficially Owned by Reporting Person

0

12 Check Box If the Aggregate Amount in Row (11) Excludes Certain Shares

13 Percent of Class Represented by Amount in Row (11)

0.0%

14 Type of Reporting Person

OO

1 Name of Reporting Person

Mary H. Cain

2 Check the Appropriate Box If A Member of a Group

(a)

(b)

3 SEC Use Only

4 Source of Funds

OO

5 Check Box If Disclosure of Legal Proceedings Is Required Pursuant to Item 2(d) or 2(e)

6 Citizenship or Place of Organization

United States of America

7 Sole Voting Power

2,087,000*

8 Shared Voting Power

400,000*

9 Sole Dispositive Power

2,087,000*

10 Shared Dispositive Power

400,000*

11 Aggregate Amount Beneficially Owned by Reporting Person

2,487,000*

12 Check Box If the Aggregate Amount in Row (11) Excludes Certain Shares

13 Percent of Class Represented by Amount in Row (11)

3.9%

14 Type of Reporting Person

IN

* 1,043,500 of these shares are owned by the Mary H. Cain Marital Trust, of which Mary H. Cain is the trustee and beneficiary.
400,000 of these shares are owned by the Gordon and Mary Cain Foundation, of which Mary H. Cain is the Chairman.

STATEMENT ON SCHEDULE 13D

This Amendment No. 4 amends and supplements the Statement on Schedule 13D (the "Initial Statement") filed by the Estate of Gordon A. Cain, Mary H. Cain, James D. Weaver and William A. McMinn, on March 19, 2003, as amended by Amendment No. 1 filed on July 22, 2003, Amendment No. 2 filed on January 2, 2004, and Amendment No. 3 filed on January 12, 2005, (collectively, the "Amendments" and, with the Initial Statement, the "Statement"), relating to the shares of Common Stock, par value \$0.001 per share (the "Common Stock") of Lexicon Genetics Incorporated, a Delaware corporation (the "Issuer"). Capitalized terms used but not defined herein shall have the meanings provided therefore in the Statement.

The Initial Statement is hereby supplemented and amended to the extent set forth in this Amendment.

Item 4. Purpose of Transaction

Aside from the transaction described in Item 5(c), Ms. Cain has no plans or proposals with respect to the Shares which relate to or that would result in any of the actions or transactions specified in clauses (a) through (j) of Item 4 of Schedule 13D.

Item 5. Interest in Securities of the Issuer

(c) On July 26, 2005, (i) Mary H. Cain sold 850,000 shares (425,000 of these shares were sold by Mary H. Cain on behalf of the Mary H. Cain Marital Trust) and (ii) The Gordon and Mary Cain Foundation sold 150,000 shares, with each selling the shares in the open market at a price of \$5.00 per share.

(e) On July 26, 2005, Mary H. Cain ceased to be the beneficial owner of more than five percent of the Common Stock of Issuer.

SIGNATURE

After reasonable inquiry and to the best of the undersigned's knowledge and belief, the undersigned hereby certifies that the information set forth in this Statement is true, complete and correct.

Dated: July31, 2005

/s/ MARY H. CAIN

Mary H. Cain

The undersigned hereby agrees to be included in the filing of the Amendment No. 4 to the Schedule 13D dated July 31, 2005 with respect to the issued and outstanding Common Stock of Lexicon Genetics Incorporated beneficially owned by the undersigned.

Dated: July31, 2005

/s/ MARY H. CAIN

Mary H. Cain