

June 24, 2015

CALA-NASDAQ--Outperform (1) / V

Biotechnology

CALA: Arginase Inhibitor CB-1158 Puts CALA On Track To Enter Immunology By Q2 2016+

Matthew J. Andrews, Senior Analyst (617) 603-4218

Sector Rating: Biotechnology, Market Weight

****On 6/23/15 CALA announced it selected CB-1158 as its lead clinical candidate for its arginase inhibitor program. CALA has had a dedicated internal effort targeting arginase inhibitors and recently augmented the portfolio with its December 2014 Mars Corporation's Symbioscience Division license.**

****Recall within the cancer cell microenvironment myeloid-derived suppressor cells (immune cells like T-regulatory cells) secrete the arginase enzyme which depletes the semi-essential amino acid arginine, important for activation of cytotoxic T-cell and natural killer-cells' activities against tumor cells. Proof-of-concept is being validated clinically by indoleamine 2,3-dioxygenase inhibitors (IDO) which look to block depletion of tryptophan. Arginase inhibitors have an identical mechanism to IDO inhibitors as they allow for the CD3 zeta chain for the T-cell co-receptor to reach the T-cell surface so it can begin signaling activities.**

****Investigational new drug application-enabling studies are underway with a goal of filing an IND by late Q1 2016.**

****Similar to IDO inhibitors where synergies are expected with programmed death-1/programmed death ligand-1 (PD-1/PD-L1) inhibitors, CALA believes CB-1158 may also be synergistic with PD-1/PD-L1 antibodies. We note that based on a 2013 Immunity Review paper by Mellman and Chen, multiple other combination approaches (for CB-1158) may be feasible, including with cancer vaccines (which target increase in CD4/CD8 T-cells), Chimeric Antigen Receptor and T-cell receptor agents, and Yervoy to name a few. As a result, following Ph. I proof-of-concept for CB-1158 it would not be a surprise to see CALA enter non-exclusive/exclusive development agreements or initiate CB-1158+PD-1/PD-L1 combination studies independently.**

****We believe a number of preclinical data could be presented at the American Association for Cancer Research-"Triple Meeting" in November 2015, along with updated Ph. I single-agent cohort expansion results for CB-839.**

****BOTTOM LINE: While not the key near-term value driver, CB-1158 provides a potential additional long-term shot on goal in the important area of immuno-oncology. Following positive CB-839 updates in June and ahead of important data read-outs later in 2015, we continue to see CALA shares as under-valued.**

Calithera Biosciences, Inc. (CALA-NASDAQ)

Price as of 6/23/2015: \$8.84

FY 15 EPS: \$-2.02

FY 16 EPS: \$-2.32

Shares Out.: 17.9 MM

Market Cap.: \$158.24 MM

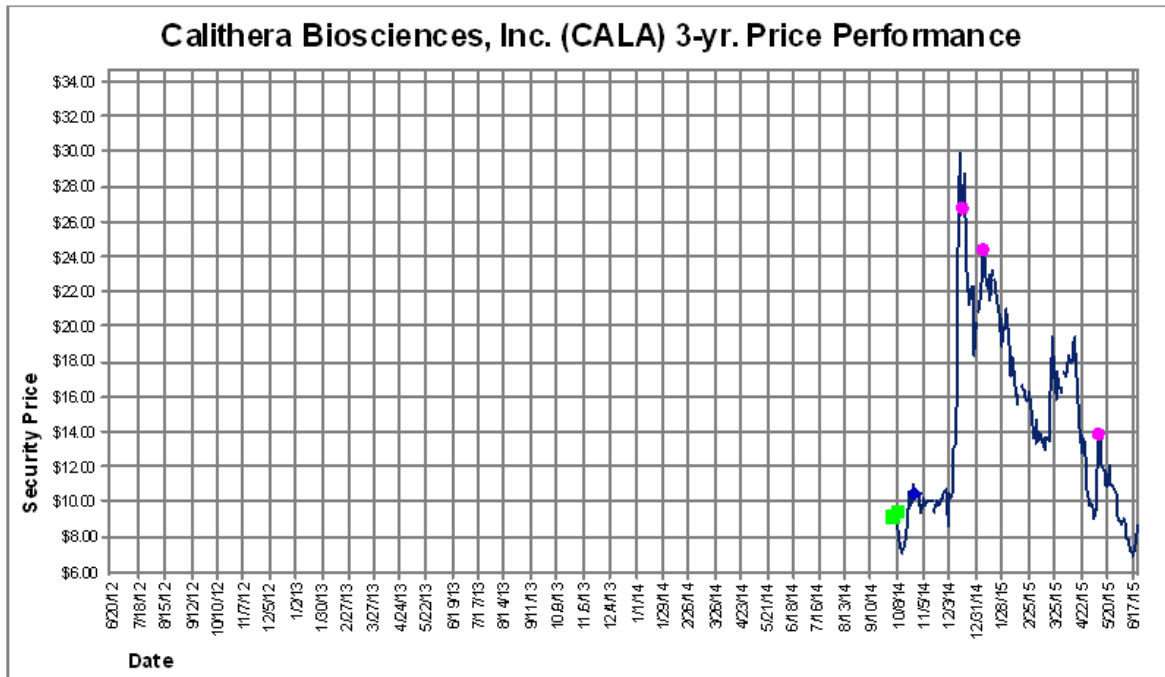
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	Date	Publication Price (\$)	Rating Code	Val. Rng. Low	Val. Rng. High	Close Price (\$)
□	10/3/2014		IPO at \$10.00			
	10/27/2014		Andrews			
◆	10/27/2014	11.04	1	19.00	20.00	10.40
●	12/15/2014	29.85	1	50.00	55.00	26.75
●	1/7/2015	23.85	1	35.00	40.00	24.40
●	5/8/2015	9.52	1	27.00	30.00	13.87

Source: Wells Fargo Securities, LLC estimates and Reuters data

Symbol Key

▼	Rating Downgrade	◆	Initiation, Resumption, Drop or Suspend
▲	Rating Upgrade	■	Analyst Change
●	Valuation Range Change	□	Split Adjustment

Rating Code Key

1	Outperform/Buy	SR	Suspended
2	Market Perform/Hold	NR	Not Rated
3	Underperform/Sell	NE	No Estimate

Additional Information Available Upon Request

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CALA: Key risks include clinical trial failure, a safety signal for CB-839, and financing risk.

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3 = Underperform: The stock appears overvalued, and we believe the stock's total return will be below the market over the next 12 months. SELL

SECTOR RATING

O = Overweight: Industry expected to outperform the relevant broad market benchmark over the next 12 months.

M = Market Weight: Industry expected to perform in-line with the relevant broad market benchmark over the next 12 months.

U = Underweight: Industry expected to underperform the relevant broad market benchmark over the next 12 months.

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As of: June 24, 2015

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