Calithera Biosciences, Inc. (CALA)

Competitor Program Highlights Importance of Robust Preclinical and Translational Biology

MARKET DATA

Price	$18.37
52-Week Range:	$6.51 - $33.48
Shares Out. (M):	17.6
Market Cap ($M):	$323.3
Average Daily Vol. (000):	193.0
Cash (M):	$102
Cash/Share:	$5.69
Enterprise Value (M):	$343
Float (M):	17.8
LT Debt (M):	$0

Source: Thomson Reuters and JMP Securities LLC

FY DEC		2014A	2015E	2016E
Revenue ($M)	1Q	NA	$0.0	--
	2Q	$0.0	$0.0	--
	3Q	$0.0	$0.0	--
	4Q	$0.0	$0.0	--
	FY	**$0.0**	**$0.0**	**$0.0**
EPS	1Q	--	($0.39)	--
	2Q	($1.22)	($0.42)	--
	3Q	($0.29)	($0.43)	--
	4Q	($0.37)	($0.44)	--
	FY	**($1.47)**	**($1.69)**	**($3.29)**
	P/E	NM	NM	NM

Source: Company reports and JMP Securities LLC

STOCK PRICE PERFORMANCE

MARKET OUTPERFORM | Price: $18.37 | Target Price: $20.00

INVESTMENT HIGHLIGHTS

Glutaminase inhibitor program highlighted at AACR underpinning the importance of Calithera Biosciences' knowledge base; reiterating our Market Outperform rating and $20 price target based on a synthesis of discounted cash flow, sum-of-the-parts and CAGR valuation methodologies. Agios (AGIO, NC) presented highlights of its glutaminase inhibitor program at an educational session entitled "Optimization of glutaminase inhibitors for the treatment of cancer," while drawing attention to the complex biology necessary to bring this class of molecules to the clinic. We believe the extensive efforts put forth by Agios to develop this inhibitor program underlie the importance of targeting this metabolomics system, and we believe Calithera is in a much better position to advance glutaminase inhibitors through the clinic. With the Calithera inhibitor, CB-839, currently in the Phase I trials (Figure 1), we look forward to additional data readouts at ASCO 2015.

There is no substitute for good old fashioned biology. We note that while the molecules developed by Agios displayed good biochemical activity, with glutaminase inhibition (9 nM IC50), cellular activity (43 nM IC50), and antiproliferative activity (50 nM IC50), they were unable to inhibit the growth of various xenografts. Agios pointed to the inability of the studied cell lines to maintain their characteristics once transplanted into mice, with altered mesenchymal characteristics overlapping with changes in glutamine dependency, specifically in a NSCLC xenograft model (Figure 3). The inability to rapidly identify a tumor system that can easily be challenged by the Agios inhibitor has led Agios to discontinue its efforts in glutaminase research. This is in stark contrast to the approach that CALA has taken in expanding its understanding of tumor biology.

While the initial approach of targeting cancer emergent metabolite pathways has benefited Agios, metabolomics study and targeting of cancer cells is complex and requires going beyond the prototypical dish to xenograft model. CALA has made a concerted effort to understand the applicability of glutaminase inhibition by examining not on the cell lines that might be responsive, as Agios has done, but also by examining primary tumor tissue glutaminase activity at the gene transcription, protein expression, and metabolite level. These efforts have led CALA to appreciate the plasticity in cancer metabolomics targeting and to focus on cancers that may benefit the most from glutaminase inhibition. As noted in our initiation, CALA published the results of its extensive characterization of breast cancer tumors that are sensitive to glutaminase inhibition. Figure 2 demonstrates the antiproliferative effect on both patient-derived, triple-negative breast cancer xenografts and JIMT-1 cell line derived xenografts. Importantly this activity correlates well with decreases in glutaminase activity

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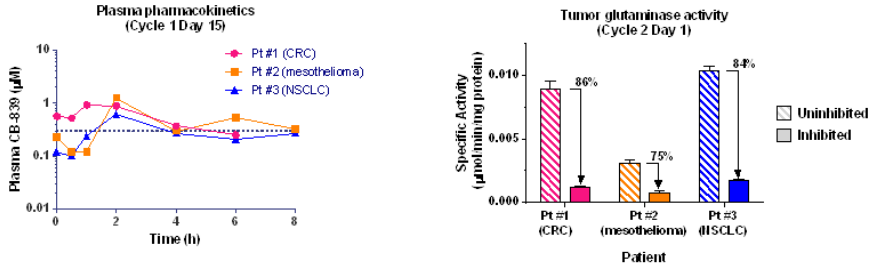
in tissue, with the greatest increases in glutamine seen in tumor tissue. Currently responses seen in the clinic include pharmacodynamic activity in patients' tumors and stable disease in four out of 24 treated patients.

We remain bullish on CALA. Calithera is an early-stage, oncology-focused drug discovery and development company attempting to exploit the increasing knowledge of the cancer cell's ability to hijack the energy production mechanisms required for the utilization of energy from a variety of sources. The company's first product candidate, CB-839, is a novel inhibitor of glutaminase, an enzyme that converts glutamine to glutamate, the latter of which is a critical feedstock for the cell's energy production system. The company was founded by Susan Molineaux, founder of Proteolix, the company that developed Kyprolis (carfilzomib) and which was eventually sold to Onyx for $700MM. Onyx, in turn, was sold to Amgen (AMGN, NC) in 2013 for $10 billion.

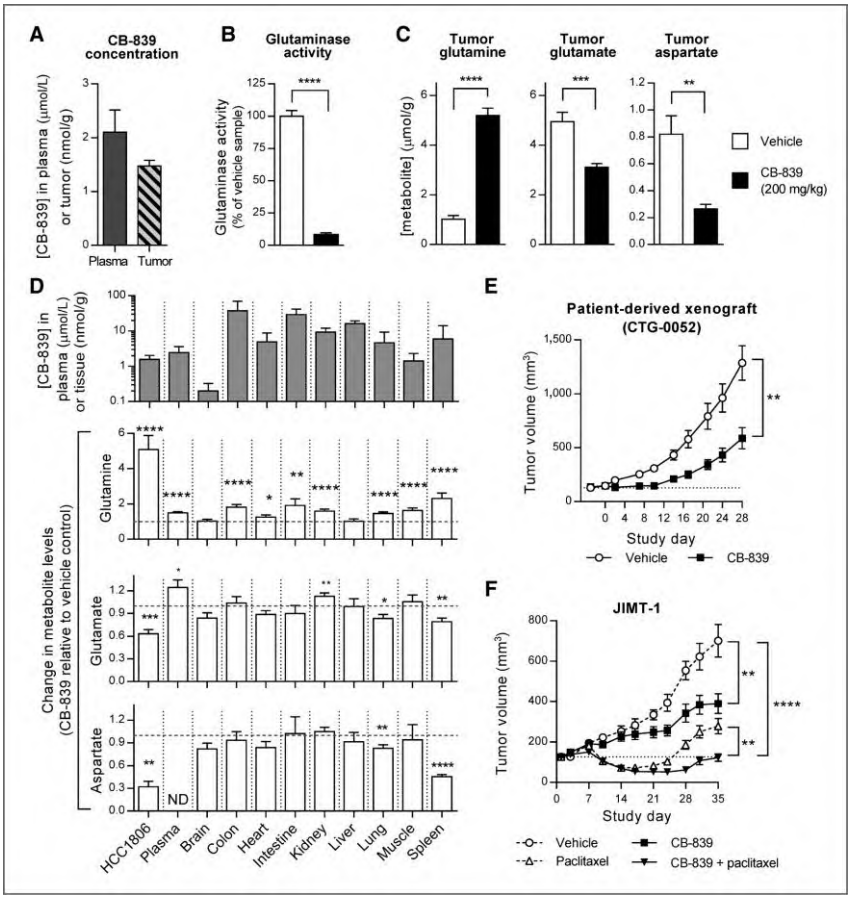
FIGURE 1. Pharmacodynamic Effects of CB-839

Patients (Early cohorts)	Tumor Type	Glutaminase Inhibition in Tumor 4 h post-dose
1	Colon (CRC)	86%
2	Mesothelioma	75%
3	Non Small Cell Lung (NSCLC)	84%



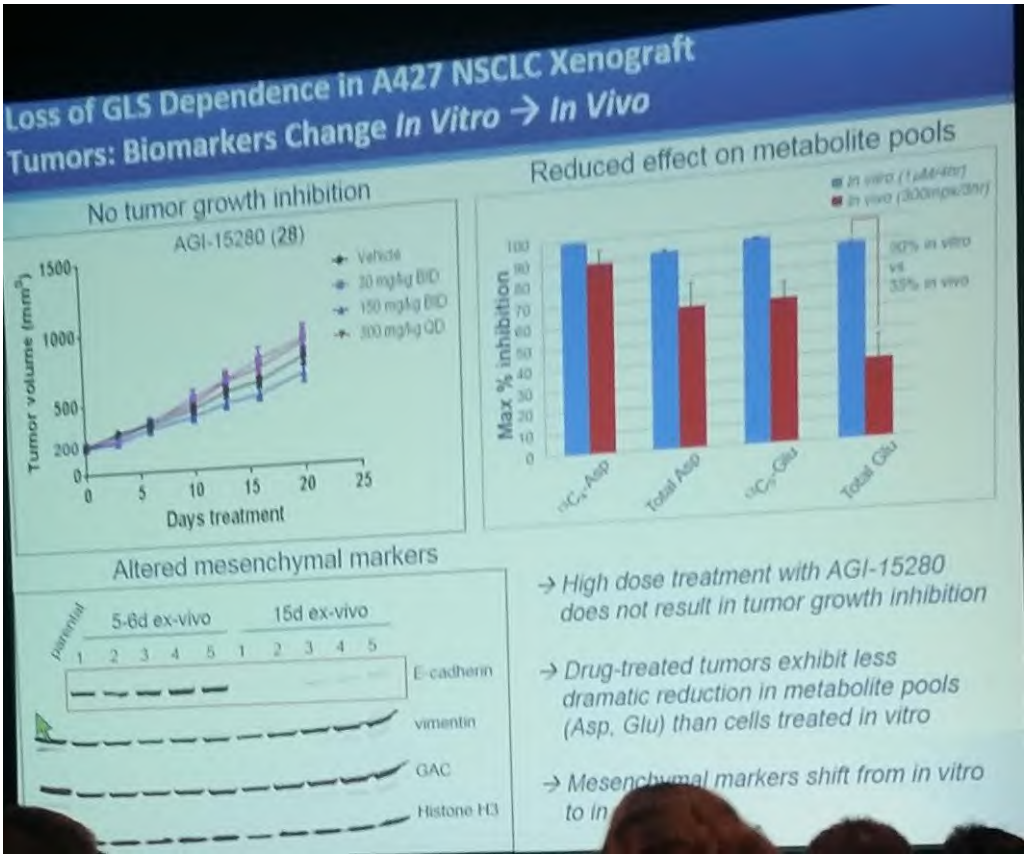
Source: Company Presentations

FIGURE 2. CB-839 Xenograft Antiproliferative Effects and Pharmacodynamics



Source: Mol. Cancer Therapeutics April 2014

FIGURE 3. Agios Glutamine Inhibitor Fails to Show Efficacy in a NSCLC Xenograft



Source: AACR 2015

FIGURE 4. CALA Income Statement

Income Statement ($MM)	1Q15E	2Q15E	3Q15E	4Q15E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E
Product Sales and Royalties:															
CB-839															
US Sales					-	-	-	54.6	310.5	625.0	965.1	1,268.5	1,459.7	1,551.8	1,616.9
ROW Royalties					-	-	-	-	6.3	41.1	86.6	132.9	182.8	211.1	226.2
Total Product Sales and Royalties	-	-	-	-	-	-	-	54.6	316.8	666.1	1,051.7	1,401.4	1,642.5	1,762.9	1,843.1
Cost of Goods Sold						-	-	6.5	37.3	75.0	115.8	152.2	175.2	186.2	194.0
Gross Profit	-	-	-	-	-	-	-	48.0	279.5	591.1	935.9	1,249.2	1,467.3	1,576.7	1,649.1
Operating Expenses:															
Research and development	5.7	6.5	7.3	8.0	27.5	55.0	110.0	170.5	221.7	266.0	292.6	321.8	354.0	389.4	428.4
% Growth					*66.9%*	*100.0%*	*100.0%*	*55.0%*	*30.0%*	*20.0%*	*10.0%*	*10.0%*	*10.0%*	*10.0%*	*10.0%*
% Total US Net Sales								*312%*	*71%*	*43%*	*30%*	*25%*	*24%*	*25%*	*26%*
General and administrative	2.0	2.2	2.3	2.4	8.9	19.6	58.7	105.7	153.3	191.6	210.8	229.8	248.2	260.6	273.6
Total operating expenses	7.7	8.7	9.6	10.4	36.4	74.6	168.7	276.2	375.0	457.6	503.4	551.6	602.2	650.0	702.0
Operating income (loss)	(7.7)	(8.7)	(9.6)	(10.4)	(36.4)	(74.6)	(168.7)	(228.2)	(95.4)	133.5	432.5	697.6	865.2	926.7	947.2
Operating margin (%)								*-418.1%*	*-30.1%*	*20.0%*	*41.1%*	*49.8%*	*52.7%*	*52.6%*	*51.4%*
Interest income															
Interest expense															
Total other income, net	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pretax income (loss)	(7.7)	(8.7)	(9.6)	(10.4)	(36.4)	(74.6)	(168.7)	(228.2)	(95.4)	133.5	432.5	697.6	865.2	926.7	947.2
Income tax benefit (provision)					0.0	0.0	0.0	0.0	4.8	(13.3)	(86.5)	(209.3)	(302.8)	(324.3)	(331.5)
Tax Rate									*5%*	*10%*	*20%*	*30%*	*35%*	*35%*	*35%*
Comprehensive income (loss)	(7.7)	(8.7)	(9.6)	(10.4)	(36.4)	(74.6)	(168.7)	(228.2)	(90.7)	120.1	346.0	488.3	562.3	602.4	615.7
Basic EPS to common shareholders	$ (0.39)	$ (0.42)	$ (0.43)	$ (0.44)	**$ (1.69)**	**$ (3.29)**	**$ (6.07)**	**$ (6.88)**	**$ (2.60)**	**$ 3.28**	**$ 9.01**	**$ 12.10**	**$ 13.28**	**$ 13.54**	**$ 13.18**
Diluted EPS to common shareholders	$ (0.39)	$ (0.42)	$ (0.43)	$ (0.44)	**$ (1.69)**	**$ (3.29)**	**$ (6.07)**	**$ (6.88)**	**$ (2.60)**	**$ 3.28**	**$ 9.01**	**$ 12.10**	**$ 13.28**	**$ 13.54**	**$ 13.18**
Basic shares outstanding	19.7	20.9	22.2	23.5	21.6	22.7	27.8	33.2	34.8	36.6	38.4	40.3	42.4	44.5	46.7
Diluted shares outstanding	19.7	20.9	22.2	23.5	21.6	22.7	27.8	33.2	34.8	36.6	38.4	40.3	42.4	44.5	46.7

Source: JMP Securities LLC and Company Reports

Company Description

Calithera Biosciences, based in San Francisco, CA, is a clinical-stage biotechnology company focused on the discovery and development of novel small molecules directed against cancer and immune cell metabolism to treat both solid tumor and hematologic malignancies. The company's lead product candidate, CB-839, is an internally discovered and wholly owned potent, oral selective inhibitor of glutaminase. Inhibition of glutaminase by CB-839, in effect, starves cancer cells of glutamate - a critical substrate for cancer cell metabolism, growth, and survival. CB-839 is currently in Phase I analysis in both solid and hematologic tumors. Planned Phase Ib cohorts in combination with standard of care agents in triple negative breast cancer and multiple myeloma are expected to be initiated. A second wholly owned pre-clinical candidate is Calithera's first-in-class arginase inhibitor, directed at immune checkpoint modulation and engaging the activation of cytotoxic T-cells. Calithera intends to submit an IND to the FDA for the arginase program in late 2015.

Investment Risks

Potential risks to our price target include, but are not limited to, clinical, regulatory, commercial, and competitive factors.

Scientific and clinical. Drug development is an inherently risky business. Cancer metabolism, and specifically, the role of glutaminase in cancer pathogenesis, remains largely unproven, creating significant risk associated with Calithera's scientific platform. Like all clinical trials, CB-839 clinical development carries some risk of failure. CB-839 may fail to maintain the requisite safety or to demonstrate meaningful efficacy to warrant further development through to regulatory approval.

Regulatory and commercial. The ability of Calithera or its potential partners to market its drugs depends on those drugs obtaining approval from the FDA and foreign regulatory agencies. Failure to achieve approval or delays in the timelines to approval could negatively impact the company's share price.

Competitive. Oncology drug development is an increasingly competitive field. Calithera faces competition from companies developing small molecule therapies also directed at cancer cell metabolism in ways that may resemble those of Calithera's pipeline. Small molecule oncology therapies employing other mechanisms of action are also in development by several biopharma companies to treat similar patient populations to that of CB-839 and may yield superior risk-benefit outcomes. Some of these companies may have access to greater resources, development, and commercial expertise compared to Calithera.

Financial. We anticipate that Calithera may seek additional equity financing in the form of a secondary offering in order to complete the development of CB-838 and advance its future pipeline candidates, exposing existing shareholders to some degree of dilution risk.

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Market Outperform (MO): JMP Securities expects the stock price to outperform relevant market indices over the next 12 months.
Market Perform (MP): JMP Securities expects the stock price to perform in line with relevant market indices over the next 12 months.
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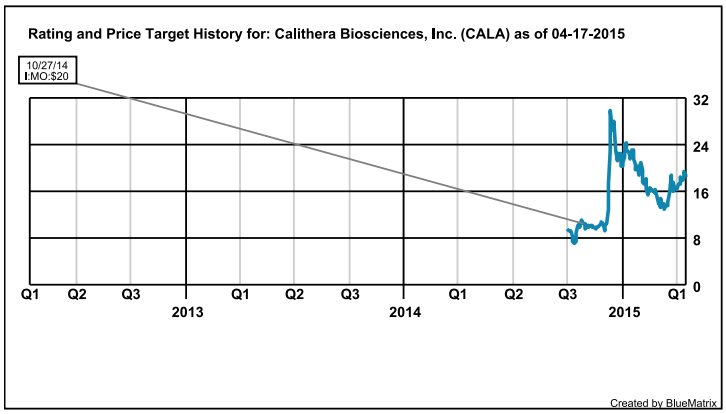
JMP Securities Research Ratings and Investment Banking Services: (as of April 20, 2015)

JMP Rating	Regulatory Equivalent	# Co's Under Coverage	*% of Total*	Regulatory Equivalent	# Co's Under Coverage	*% of Total*	# Co's Receiving IB Services in Past 12 Months	*% of Co's With This Rating*
MARKET OUTPERFORM	Buy	286	*63.27%*	Buy	286	*63.27%*	96	*33.57%*
MARKET PERFORM	Hold	145	*32.08%*	Hold	145	*32.08%*	20	*13.79%*
MARKET UNDERPERFORM	Sell	8	*1.77%*	Sell	8	*1.77%*	0	*0%*
COVERAGE IN TRANSITION		12	*2.65%*		12	*2.65%*	1	*8.33%*
TOTAL:		452	*100%*		452	*100%*	117	*25.88%*

Stock Price Chart of Rating and Target Price Changes:

Note: First annotation denotes initiation of coverage or 3 years, whichever is shorter. If no target price is listed, then the target price is N/A. In accordance with NASD Rule 2711, the chart(s) below reflect(s) price range and any changes to the rating or price target as of the end of the most recent calendar quarter. The action reflected in this note is not annotated in the stock price chart. Source: JMP Securities.



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