Zacks Small-Cap Research

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David Bautz, PhD
312-265-9471
dbautz@zacks.com

scr.zacks.com
10 S. Riverside Plaza, Chicago, IL 60606

Cerecor, Inc.

(CERC-NASDAQ)

CERC: Results From Phase 2 Clinical Trial of CERC-501 to be Reported in 4Q16…

Based on our probability adjusted DCF model that takes into account potential future revenues from CERC-301 and CERC-501, CERC is valued at $12/share. This model is highly dependent upon the clinical success of CERC-301 and CERC-501 and will be adjusted accordingly based upon future clinical results.

Current Price (08/23/16)	$4.13
Valuation	**$12.00**

OUTLOOK

On August 15, 2016, Cerecor Inc. (CERC) announced financial results for the second quarter of 2016. The company recorded $0.7 million in grant revenue and had a net loss of $3.5 million. Cerecor exited the second quarter with approximately $11.9 million in cash and cash equivalents, which we believe will fund operations through the end of 2016.

The company is currently conducting two Phase 2 clinical trials: 1) with CERC-301 for the treatment of major depressive disorder (MDD) in patients suffering a severe depressive episode despite stable treatment with standard of care medications and 2) with CERC-501 to evaluate its effect on tobacco withdrawal in heavy cigarette smokers. We anticipate topline results for CERC-301 in the first half of 2017 and for CERC-501 in the fourth quarter of 2016.

SUMMARY DATA

52-Week High	**$6.50**
52-Week Low	**$1.94**
One-Year Return (%)	**N/A**
Beta	**N/A**
Average Daily Volume (sh)	**71,372**
Shares Outstanding (mil)	**9**
Market Capitalization ($mil)	**$36**
Short Interest Ratio (days)	**N/A**
Institutional Ownership (%)	**8**
Insider Ownership (%)	**7**
Annual Cash Dividend	**$0.00**
Dividend Yield (%)	**0.00**
5-Yr. Historical Growth Rates	
Sales (%)	**N/A**
Earnings Per Share (%)	**N/A**
Dividend (%)	**N/A**
P/E using TTM EPS	**N/A**
P/E using 2016 Estimate	**N/A**
P/E using 2017 Estimate	**N/A**

Risk Level	**N/A,**
Type of Stock	**N/A**
Industry	**Med-Biomed/Gene**

ZACKS ESTIMATES

Revenue
(In millions of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2015	0.0 A	0.0 A	0.0 A	0.0 A	0.3 A
2016	0.0 A	0.7 A	0.0 E	0.0 E	0.0 E
2017					0.0 E
2018					0.0 E

Earnings per Share
(EPS is operating earnings before non-recurring items)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2015	- A	- A	- A	- A	-$4.71 A
2016	-$0.59 A	-$0.41 A	-$0.47 E	-$0.40 E	-$1.85 E
2017					-$1.50 E
2018					-$1.47 E

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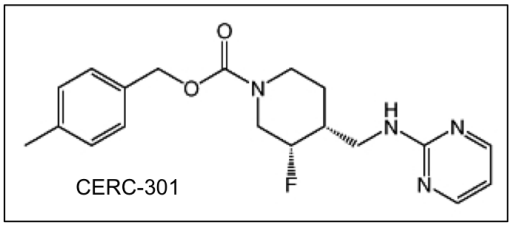
WHAT'S NEW

Business Update

Cerecor, Inc. (CERC) is a clinical stage biopharmaceutical company developing treatments for patients with neurological and psychiatric disorders. The company's lead compounds include CERC-301, an antagonist of the N-methyl-D-aspartate (NMDA) receptor, CERC-501, a potent and selective antagonist of the kappa opioid receptor (KOR), and CERC-406, a preclinical candidate from the company's proprietary catalog of catechol-O-methyltransferase (COMT) inhibitors.

CERC-301

CERC-301 is an orally available specific antagonist against the NMDA receptor subunit 2B (NR2B). The compound is being developed as an adjunctive medication in patients with severe major depressive disorder (MDD) who are not responding to their current antidepressant treatment.

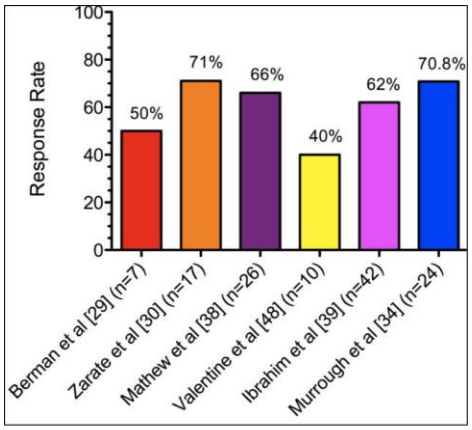


Source: Mony *et al*., 2009

As opposed to currently available MDD treatments that target monoamine neurotransmitters such as serotonin, norepinephrine, and/or dopamine, CERC-301 targets the N-methyl-D-aspartate (NMDA) glutamate receptors. These receptors are composed of various subunits to form three different subtypes: GluN1, GluN2, and GluN3 (or NR1, NR2, and NR3). There are eight variants of the NR1 subunit, four different NR2 subunits (referred to as NR2A through D), and two NR3 subunits (Paoletti *et al*., 2007). CERC-301 specifically targets the NR2B subunit.

There are a number of recent studies that show the NMDA receptors contribute to the pathophysiology of MDD (Serafini *et al*., 2013). This may be the result of an imbalance in glutamate signaling that can lead to NMDA agonism, which ultimately leads to enhanced excitatory activity in neural circuits involved in depression. Traditional monoamine antidepressants are known to interfere with glutamate system function by reducing glutamate release and synaptic transmission along with regulating NMDA receptor activity (Musazzi *et al*., 2013). However, these effects take time, but point to the opportunity to have a rapid effect on depression through NMDA antagonism.

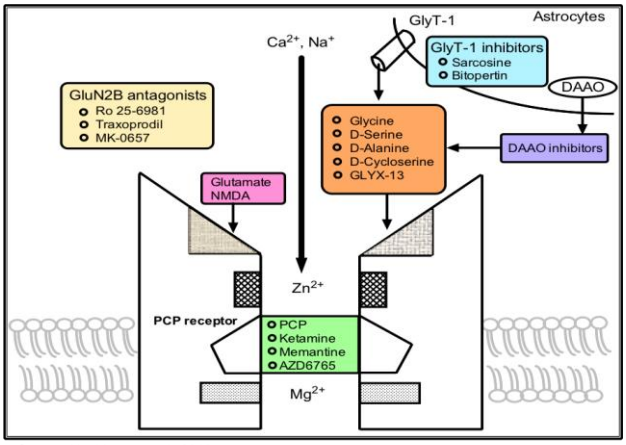
Ketamine, a drug that has been utilized for over 50 years as a dissociative anesthetic, is a known antagonist of the NMDA receptor. It was first studied as a treatment for depression in 2000 in a study involving seven patients with MDD that received a single sub-anesthetic dose (Berman *et al*., 2000). The results showed significant improvement in depressive symptoms within 72 hours of treatment with ketamine. These results were followed up by additional single-dose studies that showed very similar results (Zarate *et al*., 2006; Valentine *et al*., 2011). Multiple-dose studies have also been published showing the efficacy of ketamine in treating MDD (aan het Rot *et al*., 2010; Murrough *et al*., 2013). Ketamine also appears to have anti-suicidal properties, as shown in studies involving patients with chronic (DiazGranados *et al*., 2010) and acute (Larkin *et al*., 2011) suicide ideation. The effect of ketamine in multiple depression studies is summarized in the following figure, which shows the peak response rates for a series of trials that tested ketamine in patients with MDD (Murrough *et al*., 2012).



Source: Murrough *et al.*, 2012

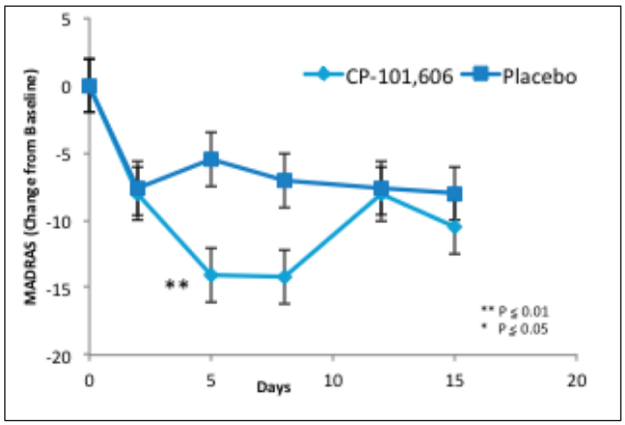
While shown to be quite effective at rapidly reducing depressive symptoms, ketamine has a number of side effects that preclude its widespread use including the fact it is a psychotomimetic that can result in toxicity and a schizophrenic-like syndrome when abused (Behrens *et al.*, 2007). What would be most optimal is a drug that has the rapid anti-depressive action of ketamine but without the toxic side effects.

The current understanding about the role of different NMDA receptor subtypes is that compounds that act as subunit-selective modulators are likely to be as efficacious but safer and with less abuse potential than non-selective NMDA receptor antagonists such as ketamine. There are a number of different compounds currently under development that target various NMDA receptor subunits, as shown in the following figure.



Source: Hashimoto *et al.*, 2013

Previous studies with other NR2B-selective antagonists have shown the potential for this class of compounds to be utilized in treating MDD. In 2008, a randomized, double blind clinical trial was performed in patients with MDD who were refractory to standard of care treatment to test CP-101,606, an NR2B-selective antagonist (Preskorn *et al.*, 2008). In this study, patients were first treated in an open-label fashion for six weeks with the SSRI paroxetine followed by a single blind placebo infusion. Those who did not respond to paroxetine (n=30) were then randomized to a single infusion of CP-101,606 or placebo followed by four additional weeks of paroxetine. As the following figure shows, patients treated with CP-101,606 exhibited a greater change in the Montgomery-Asberg Depression Rating Scale (MADRS), which is a scale used by psychiatrists to measure the severity of depressive episodes, than those treated with placebo.

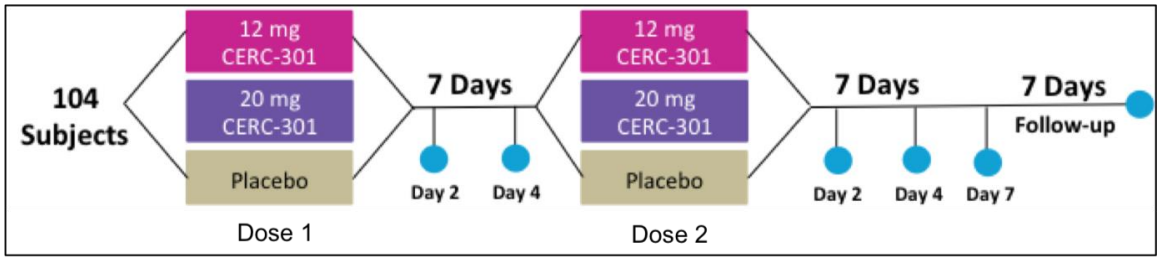


Source: Preskorn *et al*., 2008

Cerecor initiated a Phase 2 clinical trial of CERC-301 in November 2013 (NCT01941043). The 135-patient, placebo controlled trial consisted of MDD subjects who were resistant to SSRI or SNRI treatment and had recent active suicidal ideation. Patients were treated for 28 days with 8 mg/day of CERC-301 and the primary outcome was the change in the Hamilton Depression Rating Scale (HDRS) on day 7. In March 2015, Cerecor announced that the 8 mg dose used in the study did not meet the primary objective, however the drug was shown to be safe and well-tolerated. In a separate pharmacokinetic/pharmacodynamics study, 48 patients were safely treated with daily doses of CERC-301 of up to 20 mg, thus indicating that higher doses of CERC-301 could be utilized in future clinical trials.

Cerecor is currently conducting the Clin301-203 clinical trial, a Phase 2 randomized, double blind, placebo controlled study evaluating the antidepressant effect of 12 mg and 20 mg doses of CERC-301 in MDD patients currently experiencing a severe depressive episode despite stable ongoing treatment with either an SSRI or SNRI (NCT02459236). A total of 104 subjects are expected to enroll and we anticipate top-line results being released in the first half of 2017.

The primary outcome of the study is the antidepressant effect of both doses of CERC-301 compared to placebo averaged between two and four days' post-treatment as assessed by the 6-item unidimensional subset of the HDRS known as the Bech-6. This is a subscale of the HDRS that should allow for the detection of acute drug effects along with the duration of the drug effect. Key secondary objectives include evaluating the antidepressant effect of CERC-301 by the full HDRS and the 7-item unidimensional subset known as Santen-7. Additional analyses will include the antidepressant effect at two, four, and seven days after each dose as well as 14 days after the last administration of study drug by the Bech-6, Santen-7, HDRS, Clinically Useful Depression Outcome Scale-Anxiety Self Report (CUDOS-A-SR), and the Snaith-Hamilton Pleasure Scale Self Report (SHAPS-SR). Qualified site raters will administer the clinically-administered tests and the study subjects will administer self-reported scales. There are a total of nine study visits, however four of them will be conducted by phone to alleviate the burden on the subjects. The figure below gives a graphical representation of the study.



Source: Cerecor, Inc.

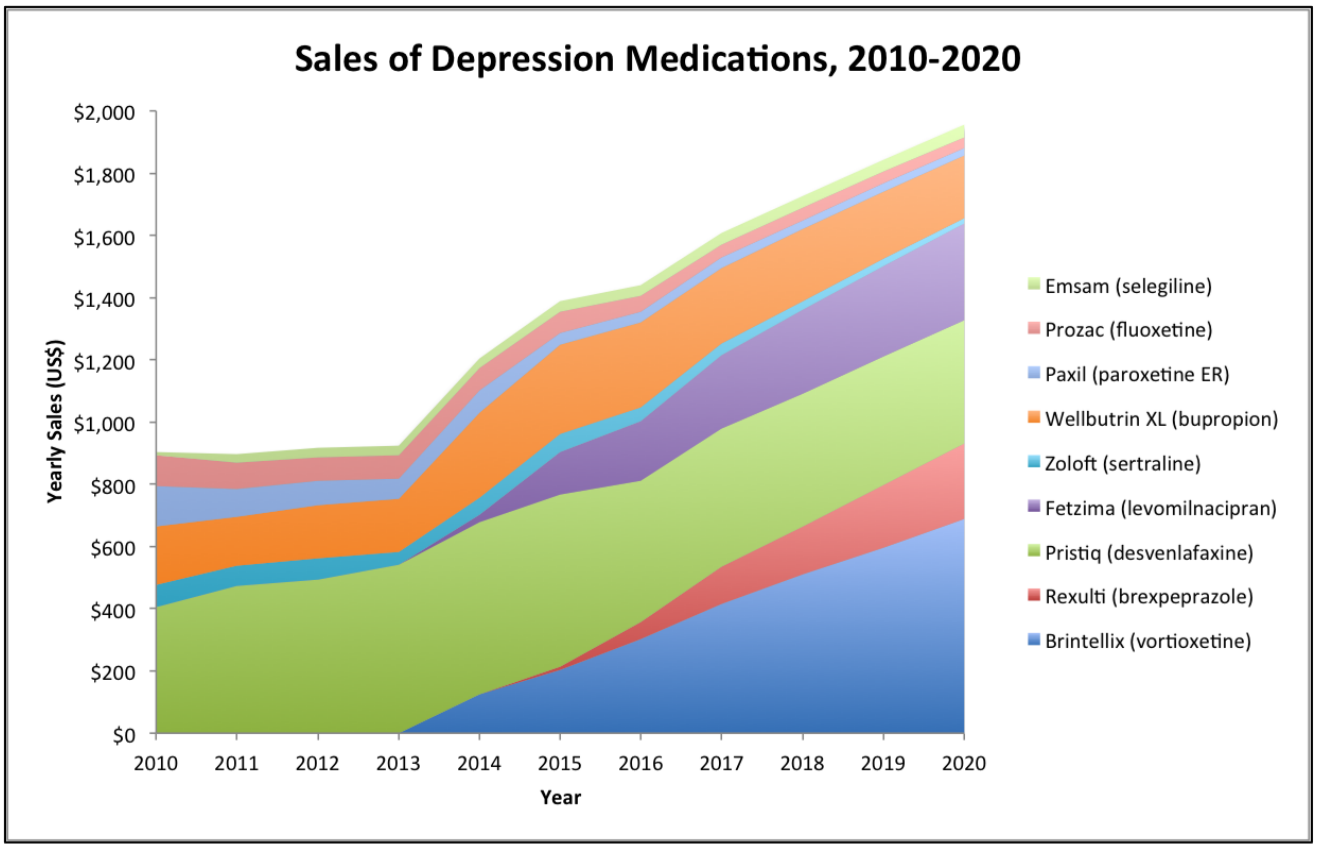
In comparison to the previous Phase 2 trial that Cerecor conducted with CERC-301, there are a number of attributes to the Clin301-203 study that we believe could lead to a greater likelihood of success. Cerecor is testing a higher dose of CERC-301 (12 mg and 20 mg) compared to the first Phase 2 study that only evaluated 8 mg/day. In addition, subjects will take the medication on an empty stomach in order to increase the bioavailability of the drug. Both of these changes will result in maximum drug concentration being two to four times higher in subjects in the Clin301-203 study than in the previous study. Other factors that make the Clin301-203 study more likely to be successful include a more rigorous inclusion/exclusion criteria, recruitment of subjects from psychiatric clinical referrals and depression clinical study databases, and the use of the Bech-6 scale, which is more sensitive to acute changes from fast-acting antidepressants.

The FDA designated CF-301 as a Fast Track product for the treatment of MDD. The Fast Track program was put into place under the FDA Modernization Act of 1997 and is a process designed to facilitate the development, and expedite the review of drugs to treat serious conditions and fill an unmet medical need.

Opportunity in MDD

The treatment of depression represents a significant market opportunity. As mentioned above, approximately 16 million adults in the U.S. will suffer from a major depressive episode during any 12-month period. Of those, approximately 4 million are treated with drug therapy, which is the current target market for CERC-301. Due to the increasing prevalence of generic medications, many 'Big Pharma' companies have exited the space or are waiting for smaller biotech companies to produce positive early-stage results before re-entering the market. With an increased understanding of the disease and better treatment target validation, a company such as Cerecor could realize a significant jump in value with positive clinical results.

The following chart shows the U.S. sales of different prescription depression medications from 2010-2020. The data after 2015 is from consensus analyst's forecasts (EvaluatePharma). Growth in the market is going to be supplied by new entrants to the market such as Brintellix, Rexulti, and Fetzima. Even with a number of different treatment options available, there is still plenty of room in the market for an effective treatment with a differentiated mechanism of action.



Source: EvaluatePharma; Zacks SCR

There are currently five other programs in development by other companies for compounds that are rapid onset antidepressants or anti-suicide treatments:

- **Esketamine**: This is the S(+) enantiomer of ketamine. It is being developed by Johnson and Johnson as an intranasally administered adjunct treatment for patients with MDD and is currently in a Phase 3 clinical trial.

- **Rapastinel**: This is an intravenously administered peptide that is a partial agonist of the glycine site of the NMDA receptor being developed as a adjunctive treatment for MDD by Allergan. It recently received Breakthrough Therapy designation from the FDA and Phase 3 clinical trials should be underway soon.

- **NRX 1074**: This is an orally administered small molecule drug that acts as a partial agonist of the glycine site of the NMDA receptor being developed as a adjunctive treatment for MDD by Allergan. Phase 2 clinical trials are set to get underway in 2016.

- **AZD8108**: This is an orally administered NMDA receptor antagonist being developed by AstraZeneca. It has completed Phase 1 studies.

- **AV-101**: This is a prodrug of 7-chloronurenic acid, which is a selective antagonist of the glycine site of the NMDA receptor antagonist and is being developed by VistaGen Therapeutics. The compound is currently in a Phase 2 clinical trial for the treatment of MDD.

CERC-501

Drug abuse is a significant public health problem. According to the 2013 National Survey on Drug Use and Health (NSDUH), which is an annual survey sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), there were 24.6 million Americans aged 12 or older (9.4% of the population) who were illicit drug users, 16.5 million people who reported heavy drinking, and 66.9 million Americans who were current users of a tobacco product.

Cigarette smoking is the leading cause of preventable death in the U.S. and is responsible for approximately 480,000 deaths each year (CDC). In addition, life expectancy for those who smoke is at least 10 years shorter than for nonsmokers (Jha *et al*., 2013). While smoking rates continue to decrease, there are still an exceptionally high number of Americans that smoke, resulting in an estimated $170 billion spent each year for illnesses caused by tobacco use.

It is estimated that up to one-third of patients with MDD also suffer from substance abuse disorder (Davis *et al*., 2008). A study of over 40,000 adults found that in those suffering from alcohol abuse disorder, approximately 20% of them also met the criteria for MDD (Pettinati *et al*., 2011). Unfortunately, current treatment options for co-occurring disorders consist of either treatment for the psychiatric condition or the treatment of the addiction, but not the underlying connection between the two. For example, naltrexone is FDA-approved for the treatment of alcohol dependence but is not approved as either an antidepressant or anti-anxiety agent. Varenicline is an anti-smoking agent, however one of its side effects is depression. Thus, there is a clear unmet need for treatments that are effective at treating both the psychiatric and addiction aspects of co-occurring conditions.

The link between substance abuse and depression may have to do with stress. A continually stressful environment can increase the risk of clinical depression and substance abuse, and both stress and mood play a significant role in addiction relapse (Watkins *et al*., 2000). Kappa opioid receptors (KORs) and their ligand dynorphin are localized to portions of the brain involved in reward and stress and are believed to play a role in mood, stress, and addictive disorders (Shippenberg *et al*., 2007). Preclinical models show that stress produces a prodepressive phenotype through the activation of KORs.

A significant amount of evidence has been accumulated showing how the KOR sits at the nexus of reward/mood/addictive behaviors, including:

- Cocaine abuse leads to upregulated expression of dynorphin, which can lead to depressive symptoms upon cessation of cocaine use (Sivam, 1989). Similar results are seen with other drugs of abuse such as heroin (Solecki *et al*., 2009) and alcohol (Przewlocka *et al*., 1997).

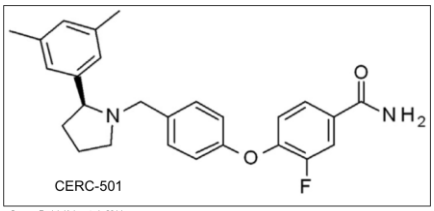
- Stress leads to an increase in dynorphin levels (Przewlocki *et al*., 1987).

- Activation of KORs produces depressant-like behavior in animal models (Carlezon *et al*., 2006).

- KOR antagonists exhibit antidepressant-like effects in animal models (Mague *et al*., 2003).

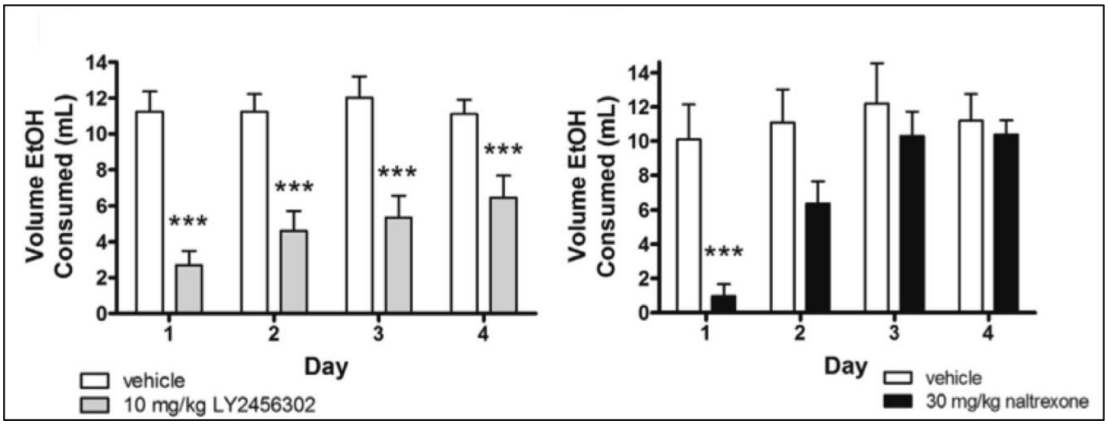
For a comprehensive overview of the role that the KOR plays in depression, stress, and substance abuse, please see the article “The kappa opioid receptor: from addiction to depression, and back” (Lalanne *et al*., 2014).

Cerecor is developing CERC-501, an orally available, highly specific KOR antagonist, as a treatment for substance use disorder, adjunctive treatment of MDD, and potentially for co-occurring disorders. Cerecor acquired the rights to CERC-501, then LY2456302, through an exclusive, worldwide license from Eli Lilly and Company in February 2015.



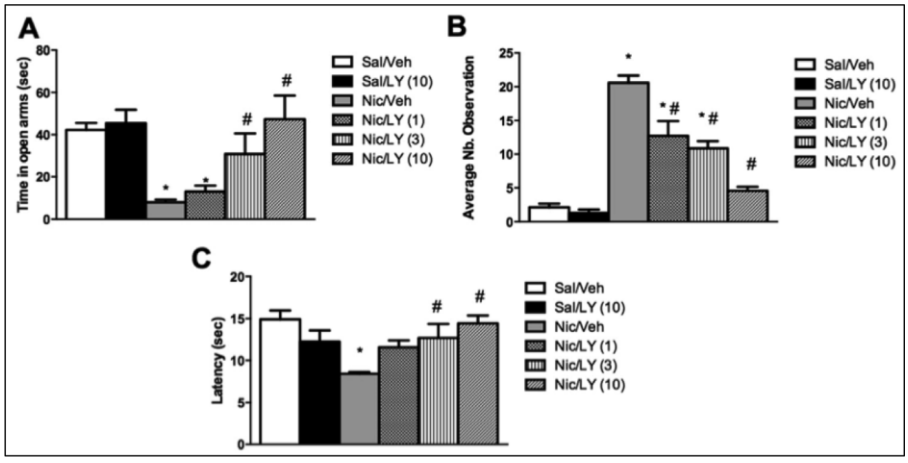
Source: Rorick-Kehn *et al*., 2014

CERC-501 is highly selective for the kappa opioid receptor as it has 21-fold higher affinity for the kappa opioid receptor compared to the mu receptor and 135-fold higher affinity over the delta opioid receptor (Mitch *et al*., 2011). Preclinical studies showed that CERC-501 dose-dependently produced an antidepressant-like response in the forced swim test and significantly attenuated continuous ethanol self-administration in female rats with a history of high ethanol intake (Rorick-Kehn *et al*., 2014). The following figure shows that CERC-501 (LY2456302) significantly reduced ethanol consumption on each of the four days of treatment, while naltrexone was only effective on day 1, with tolerance developing by day 2.



Source: Rorick-Kehn *et al*., 2014

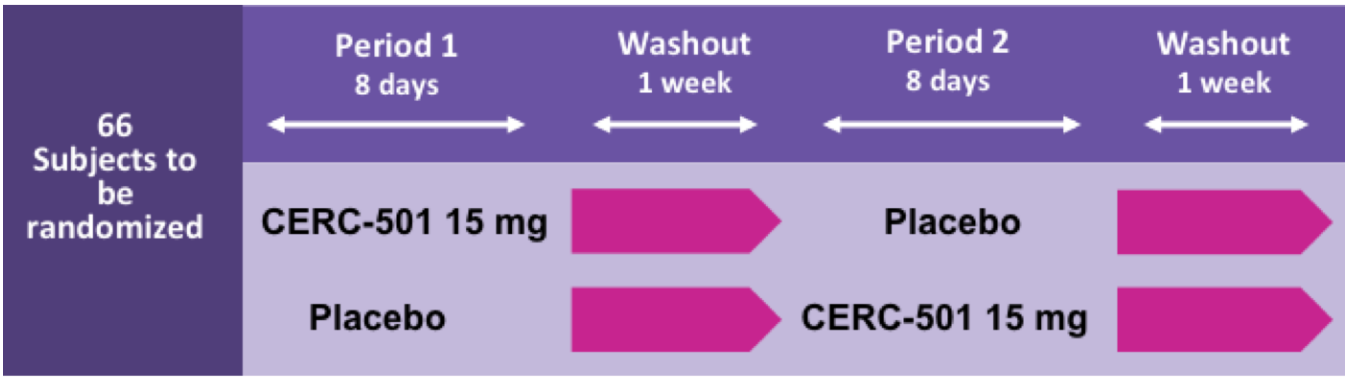
The ability of CERC-501 to treat nicotine withdrawal was studied in an established rodent model where mice were chronically treated with nicotine for two weeks and then studied for withdrawal behaviors 18-24 hours after removal of nicotine with and without CERC-501 (Jackson *et al*., 2015). The following figure shows that pretreatment with 3 and 10 mg/kg CERC-501 significantly A) decreased the expression of anxiety-related behaviors; B) decreased expression of somatic withdrawal signs; and C) decreased the expression of hyperalgesia. These data support the notion that CERC-501 alleviates physical and affective nicotine withdrawal signs in mice and could be effective in supporting smoking cessation.



Source: Jackson *et al*., 2015

The safety, tolerability, and pharmacokinetics of CERC-501 was tested in a Phase 1 clinical trial in healthy subjects (Lowe *et al*., 2014). Single doses of 2 mg to 60 mg and multiple doses of 2, 10, and 35 mg were administered alone and in combination with ethanol. There were no clinically significant findings and all doses were well tolerated. In addition, there was no evidence for any interaction with ethanol.

Cerecor is currently conducting the Clin501-201 clinical trial, which is a randomized, double blind, placebo controlled trial to evaluate the effects of 15 mg of CERC-501 on tobacco withdrawal and reinstatement and to assess craving, mood, and anxiety during 18 hours of abstinence in 66 heavy cigarette smokers (NCT02641028). Cerecor received a $1 million grant from the National Institute on Drug Abuse to help fund the study. The following graphic gives an overview of the study showing the crossover design, which allows the subjects to be their own control and also significantly increases trial power.



Source: Cerecor, Inc.

Each period of the trial consists of a seven-day treatment period followed by a single testing day on Day 8. The testing day consists of nicotine deprivation for 18 hours, beginning on the evening of Day 7, and continuing to mid-day of Day 8. This is followed by a smoking lapse test, where subjects are presented with a tray of their preferred brand of cigarettes and an ashtray. The subjects will be told they can smoke as much as they like for 50 minutes (delay period), however for each five-minute block of time a subject delays smoking, they receive a financial reward. Following the smoking of the first cigarette or the end of the 50-minute period, subjects will be provided with eight cigarettes of their preferred brand and allowed to smoke for 60 minutes (self-administration period). The number of cigarettes smoked will be recorded. The primary endpoints of the study are the number of minutes and seconds to the start of tobacco use during the delay period and the number of cigarettes smoked during the self-administration period. Results from this study are expected in the fourth quarter of 2016.

In July 2016, Cerecor announced the receipt of two grants to aid in the development of CERC-501: 1) a $1 million grant to aid in the development of CERC-501 in alcohol use disorder and 2) a grant awarded to Dr. Colin Haile to assess the efficacy of CERC-501 in reducing post traumatic stress disorder (PTSD)-induced alcohol use disorder in animal models.

External Clinical Trials of CERC-501

There are currently two external clinical trials being conducted that involve CERC-501:

- Impact of the KOPr Antagonist OpRA Kappa in Persons at Specific Sages of Cocaine Addiction Trajectory, Versus Normal Volunteers. This is a single-site study being conducted under the leadership of Dr. Mary Kreek of The Rockefeller University Hospital.

- A Phase 2 Study to Evaluate the Kappa Opioid Receptor As a Target for the treatment of Mood and Anxiety Spectrum Disorders by Evaluation of Whether LY2456302 Engages Key Neural Circuitry Related to Hedonistic Response. This six site clinical trial is being conducted under the leadership of Dr. Andrew Krystal.

Cerecor may end up sponsoring one or both of those trials, depending upon the results of the Clin501-201 study. The NIMH was conducting an additional clinical study of CERC-501 for treatment-resistant depression, however that study was discontinued due to slow study progression.

Opportunity in Treating Nicotine Use

There are approximately 67 million Americans who use tobacco products. Of these, approximately 69%, or 46 million individuals, are interested in quitting. A little more than 50% (24 million) attempted to quit in the past year, and of those only 6% were successful (CDC). Thus, there is a huge unmet medical need for those who would like to

quit use of tobacco products but are unable to do it on their own. Currently, there are very few therapeutic options available to help control nicotine addiction. The total market for smoking cessation in 2015 was close to $800 million, which was split approximately 50/50 between over the counter (OTC) medications and Chantix® (varenicline).

Cognitive Dysfunction in MDD

One of the primary mediators of functional impairment in patients suffering from MDD is cognitive dysfunction, which is a loss of basic intellectual functions such as memory, problem solving, reasoning, and learning. Most of those who suffer from MDD complain of some type of cognitive impairment. Criterion items for a diagnosis of MDD include a diminished ability to think or concentrate along with indecisiveness. Numerous studies have shown differences between healthy subjects and those with MDD in areas such as attention, executive function, learning, and memory along with cognitive affective bias, which results in focus moving away from positive stimuli and toward negative stimuli (Murrough *et al*., 2011).

While cognitive dysfunction may improve in those successfully treated for MDD, there is ample evidence to support the notion that certain cognitive deficits can persist. A 3-year study of those with MDD showed cognitive dysfunction in 94% of patients during acute depressive episodes and 44% during partial or full remission (Conradi *et al*., 2011). This suggests that cognitive dysfunction may be separate from mood symptoms in those suffering from MDD and that a subset of MDD patients would likely benefit from a treatment targeted to alleviate cognitive dysfunction.

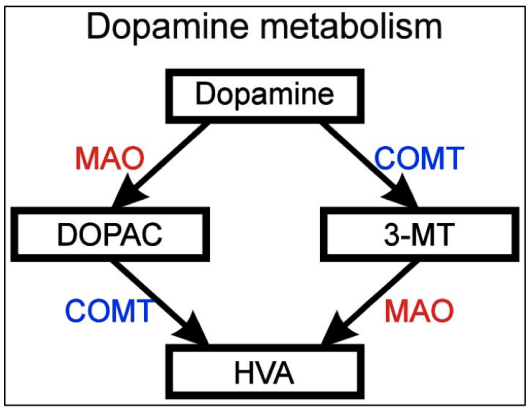
COMT as a Target for Treating Cognitive Dysfunction

Catechol-O-methyltransferase (COMT) is a promising candidate gene for modulating cognition function and dysfunction. The *COMT* gene encodes for two distinct isoforms: soluble-COMT (sCOMT) and membrane-bound COMT (mbCOMT) (Männistö *et al*., 1999). mbCOMT is expressed in the brain and has a much higher affinity for dopamine than sCOMT (Chen *et al*., 2011). Dopamine has a critical role in higher-order cognition in humans, impacting both thought and emotion, particularly in the pre-frontal cortex (Goldman-Rakic, 1999). COMT is responsible for the degradation of dopamine in the PFC. The level of dopamine in the brain is very tightly controlled, with too much or too little having negative consequences. Thus, since COMT is a key regulator of dopamine level, it has emerged as a prime target for augmenting cognitive function and COMT inhibition has been theorized to potentially impact executive function in patient's suffering from various ailments including Parkinson's disease and schizophrenia.

A couple of key characteristics of COMT inhibition are likely to facilitate drug development: genetic variability in the *COMT* gene and a readily available biomarker.

- **Genetic Variability**: Genetic studies have proven that a single nucleotide polymorphism in the *COMT* gene due to an adenine to guanine transition results in a methionine (Met) to valine (Val) substitution at amino acid 158 of the COMT protein (Lachman *et al*., 1996). The Val form of the enzyme leads to higher COMT protein levels and approximately 40% greater enzymatic activity compared to the Met form (Chen *et al*., 2004). These differences have real-world implications, as homozygous Val-COMT carriers have decreased performance on tests of executive control when compared to homozygous Met-COMT carriers (Malhotra *et al*., 2002). Drugs that target the dopaminergic system interact with these genetic variants, as shown by amphetamine improving cognitive performance in homozygous Val-COMT carriers but impairing it in homozygous Met-COMT carriers (Mattay *et al*., 2003). Thus, targeting those individuals that carry Val-COMT is likely to prove beneficial, as that group of patients appear most likely to benefit from pharmacological intervention.

- **Biomarker**: Inhibition of COMT is easily monitored through the quantification of the level of two compounds in the cerebrospinal fluid. The figure below shows that dopamine can be broken down via one of two pathways. The first step is catalyzed by either COMT to yield 3-methoxytyramine (3-MT) or monoamine oxidase aldehyde dehydrogenase (MAO) to yield 3,4-dihydroxyphenylacetic acid (DOPAC). The second step involves the conversion of DOPAC to homovanillic acid (HVA) by COMT or 3-MT to HVA by MAO. Thus, inhibition of COMT results in an accumulation of DOPAC (as no 3-MT is created from dopamine) and a decrease in HVA (as the DOPAC that was manufactured in step 1 can not be converted to HVA). The levels of each of the compounds can be correlated to the level of COMT inhibition.



Source: researchgate.net

COMTi Platform and CERC-406

In 2013, Cerecor acquired the rights to the COMT inhibitor (COMTi) platform from Merck. The platform comprises a group of COMT inhibitors that are selective for mbCOMT compared to sCOMT. The selectivity offered by these compounds is likely to lead to fewer off-target toxicities and side effects that were seen with previous COMT inhibitors such as tolcapone (liver toxicity) and entacapone (diarrhea). Cerecor's compounds are designed to fully penetrate the blood-brain barrier and to be highly selective for mbCOMT, potentially leading to higher efficacy with lower doses.

The lead compound from the COMTi platform is CERC-406, an orally available small molecule that has low inhibitory activity for sCOMT. The company is initially planning to develop CERC-406 as an adjunctive medication for patients with residual cognitive impairment due to MDD. CERC-406 was selected in part based on preclinical data showing a lower potential for periphery inhibition of COMT, rapid absorption and bioavailability, accessibility to the brain, and a favorable dose-dependent biomarker profile in rodents. The company is hopeful that CERC-406 will be effective in homozygous Val-COMT patients who have higher levels of COMT activity and lower levels of dopamine in the PFC, thus potentially restoring proper levels of dopamine and positively impacting cognitive function. Preclinical studies of CERC-406 are continuing with an IND filing likely in 2017.

Financial Update

On August 15, 2016, Cerecor announced financial results for the second quarter of 2016. The company recorded $0.7 million in revenue from the $1 million grant received from the National Institute on Drug Abuse to support the company's ongoing Phase 2 clinical trial of CERC-501 in smoking cessation. Net loss for the quarter was $3.5 million, or $0.41 per share, and consisted of $2.5 million in R&D expenses and $1.6 million in G&A expenses. This compared to $1.9 million in R&D expenses and $1.0 million in G&A expenses for the corresponding time period in 2015. The increase in R&D expenses was primarily attributable to a $0.9 million increase in costs for CERC-501 while the increase in G&A expenses was due primarily to increased costs associated with being a public company.

As of June 30, 2016, Cerecor had approximately $11.9 million in cash and cash equivalents, which we estimate is enough to fund operations through the rest of 2016. This was mainly due to the company's initial public offering in October 2015 that resulted in gross proceeds of $23.7 million.

As of August 9, 2016, the company had approximately 8.65 million shares outstanding. In addition, there are approximately 1.5 million stock options and 7.5 million warrants for a fully diluted share count of 17.7 million.

Valuation

We value Cerecor using a probability adjusted discounted cash flow model that takes into account potential future revenues for CERC-301 and CERC-501. We do not include CERC-406 in our model yet due to the fact that it is still in preclinical development.

For CERC-301, we anticipate that Cerecor will partner the drug and ultimately receive a net 15% royalty on net sales. This takes into account the high single-digit royalty that would be due to Merck upon commercialization of CERC-301. We model for a price of $20 per day in the U.S. and $16 per day in the rest of the world and assume that patients would take the drug for approximately nine months out of the year. Our model calls for a Phase 3 clinical program to get underway in 2018, an NDA filing in 2020, and approval in 2021. We believe approval outside

the U.S. would be approximately one year later.

We estimate there are approximately 16 million adults in the U.S. that suffer from MDD each year and approximately 25% of those are treated pharmacologically, which translates to a target population of four million individuals. Outside the U.S., we conservatively estimate another four million individuals are treated with anti-depressants each year. With peak market penetration of 10%, this translates into peak worldwide revenues for CERC-301 of approximately $4 billion. Applying a 10% gross-to-net adjustment, a 96% patient compliance, a 15% net royalty rate, and an 18% discount rate leads to a net present valuation for CERC-301 of $216 million.

For CERC-501, we only include the use of the drug in smoking cessation in our model and have not included any potential revenues from the drug as a treatment for MDD as Cerecor is not conducting trials in that treatment area right now. We anticipate that Cerecor will partner the drug and ultimately receive a net 12% royalty on net sales. This takes into account the tiered royalty rate ranging from mid-single digits to low-double digits that will be due to Eli Lilly upon commercialization of CERC-501. We model for smoking cessation treatment with CERC-501 to cost approximately $180 in the U.S. and $90 outside the U.S. Our model calls for approval of CERC-501 in the U.S. in 2021, and outside the U.S. in 2022.

We estimate there are approximately 55 million smokers in the U.S. and that approximately 45% of those will attempt to quit each year. Outside the U.S., we estimate approximately 80 million smokers with 33% of those attempting to quit each year. We model for peak market penetration of 10% in the U.S. and 5% outside of the U.S., which leads to potential peak worldwide revenues of approximately $500 million. We apply a 12% gross-to-net adjustment, a 96% patient compliance, a net 12% royalty rate, and an 18% discount rate, which leads to a net present valuation for CERC-501 of $21.2 million.

Combining the net present value for CERC-301 and CERC-501 along with the company's current cash total and expected operating burn of $40 million we arrive at a net present value for the company of $213.8 million. Dividing this by the company's fully diluted share count of approximately 17.7 million shares leads to a valuation of approximately $12/share. The stock is currently trading at a significant discount to this valuation, and we believe that positive data from the company's ongoing Phase 2 clinical trials is likely to cause an increase in the share price more in alignment with our valuation.

PROJECTED FINANCIALS

Cerecor, Inc.
Income Statement

Cerecor, Inc.	2015 A	Q1 A	Q2 A	Q3 E	Q4 E	2016 E	2017 E	2018 E
CERC-301	$0	$0	$0	$0	$0	$0	$0	$0
YOY Growth	-	-	-	-	-	-	-	
CERC-501	$0	$0	$0	$0	$0	$0	$0	$0
YOY Growth	-	-	-	-	-	-	-	
CERC-406	$0	$0	$0	$0	$0	$0	$0	$0
YOY Growth	-	-	-	-	-	-	-	
Grants & Collaborative Revenue	$0	$0	$1	$0	$0	$1	$0	$0
YOY Growth	-	-	-	-	-	-	-	
Total Revenues	**$0**	**$0**	**$1**	**$0**	**$0**	**$1**	**$0**	**$0**
YOY Growth	-	-	-	-	-	-	-	
Cost of Sales	$0	$0	$0	$0	$0	$0	$0	$0
Product Gross Margin	-	-	-	-	-	-	-	
Research & Development	$6.6	$2.3	$2.5	$2.3	$2.3	$9.4	$11.0	$13.0
General & Administrative	$4.4	$2.6	$1.6	$2.6	$2.7	$9.6	$12.0	$14.0
Other Expenses	$0	$0	$0	$0	$0	$0	$0	$0
Operating Income	($11.0)	($4.9)	($3.5)	($4.9)	($5.0)	($18.3)	($23.0)	($27.0)
Operating Margin	-	-	-	-	-	-	-	
Non-Operating Expenses (Net)	$0.5	($0.2)	($0.0)	$0.2	$0.2	$0.2	$0.5	$0.5
Pre-Tax Income	($10.5)	($5.1)	($3.5)	($4.7)	($4.8)	($18.2)	($22.5)	($26.5)
Income Taxes Paid	$0	$0	$0	$0	$0	$0	$0	$0
Tax Rate	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
Net Income	**($10.5)**	**($5.1)**	**($3.5)**	**($4.7)**	**($4.8)**	**($18.2)**	**($22.5)**	**($26.5)**
Net Margin	-	-	-	-	-	-	-	
Reported EPS	**($4.71)**	**($0.59)**	**($0.41)**	**($0.47)**	**($0.40)**	**($1.85)**	**($1.50)**	**($1.47)**
YOY Growth	-	-	-	-	-	-	-	
Basic Shares Outstanding	2.2	8.7	8.7	10.0	12.0	9.8	15.0	18.0

Source: Zacks Investment Research, Inc. *David Bautz, PhD*

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