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MediciNova, Inc.

(MNOV-NASDAQ)

MNOV: FDA Gives OK to Initiate Clinical Trial of MN-166 to Prevent ARDS in COVID-19 Patients…

Based on our probability adjusted DCF model that takes into account potential future revenues from MN-166 in ALS, progressive MS and addiction and MN-001 in NASH and IPF, MNOV is valued at $25/share. This model is highly dependent upon continued clinical success of both MN-166 and MN-001 and will be adjusted accordingly based upon future clinical results.

Current Price (07/02/20)	$5.79
Valuation	**$25.00**

OUTLOOK

On July 1, 2020, MediciNova, Inc. (MNOV) announced that the Investigational New Drug application (IND) for MN-166 (ibudilast) for the prevention of acute respiratory distress syndrome (ARDS) caused by COVID-19 was accepted by the U.S. FDA and the company may proceed with a clinical trial. The randomized, double blind, placebo controlled trial will test seven days of treatment with up to 100 mg/day of MN-166 versus placebo with the co-primary endpoints being the proportion of subjects free of respiratory failure, subjects change in clinical status, and plasma cytokine levels. We look forward to data from this trial as we believe MN-166 has the potential to be a game-changer in terms of preventing deaths from COVID-19.

SUMMARY DATA

52-Week High	**$10.42**
52-Week Low	**$2.90**
One-Year Return (%)	**-41.57**
Beta	**1.72**
Average Daily Volume (sh)	**158,912**
Shares Outstanding (mil)	**44**
Market Capitalization ($mil)	**$255**
Short Interest Ratio (days)	**N/A**
Institutional Ownership (%)	**22**
Insider Ownership (%)	**15**
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 2018 Estimate	**N/A**
P/E using 2019 Estimate	**N/A**

Risk Level	**Above Avg.**
Type of Stock	**Small-Blend**
Industry	**Med-Biomed/Gene**

ZACKS ESTIMATES

Revenue
(In millions of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2019	0 A	0 A	0 A	0 A	0 A
2020	0 A	0 E	0 E	0 E	0 E
2021					0 E
2022					0 E

Earnings per Share

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2019	-$0.11 A	-$0.09 A	-$0.05 A	-$0.04 A	-$0.30 A
2020	-$0.06 A	-$0.08 E	-$0.09 E	-$0.09 E	-$0.33 E
2021					-$0.34 E
2022					-$0.35 E

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WHAT'S NEW

Business Update

FDA Approves Clinical Plan for MN-166 to Prevent ARDS Caused by COVID-19

On July 1, 2020, MediciNova, Inc. (MNOV) announced that the company's Investigational New Drug application (IND) for MN-166 (ibudilast) for the prevention of acute respiratory distress syndrome (ARDS) caused by COVID-19 was approved by the U.S. FDA and that a clinical trial may initiate.

The proposed trial will be a randomized, double blind, placebo controlled, parallel group study in hospitalized COVID-19 patients who are at risk of developing ARDS (NCT04429555). Eligible patients will be receiving standard-of-care therapy, which includes anticoagulation therapy. Inclusion criteria includes:

- a positive PCR test for SARS-CoV-2 infection
- chest imaging with abnormalities consistent with COVID-19 pneumonia
- $SpO_2 \leq 92\%$ on room air, respiratory rate ≥ 24 breaths per min, and/or requirement for supplemental oxygen
- At least one of the following risk factors: age > 65, underlying serious heart disease, chronic lung disease, moderate to severe asthma, BMI ≥ 40, or diabetes

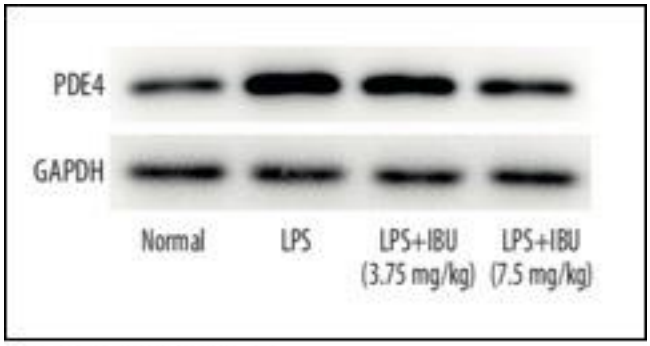
Patients will be randomized to receive up to 100 mg/day MN-166 (50 mg b.i.d) or placebo for seven days, with follow-up examinations on days 14 and 28. The co-primary endpoints include the proportion of subjects free from respiratory failure (defined by the need for decreased oxygen requirements), the mean change from baseline in clinical status using the NIAID 8-point ordinal scale, the percentage of patients with improvement in clinical status, and the change from baseline in the following cytokine levels: macrophage migration inhibitory factor (MIF), interleukin (IL)-1β, IL-6, tumor necrosis factor (TNF)-α, and c-reactive protein (CRP).

MN-166 Identified as Potential Inhibitor of SARS-CoV-2 Replication

A recently published study screened 1,520 compounds from the Prestwick Chemical Library® to evaluate potential anti-SARS-CoV-2 activity in a SARS-CoV-2 virus infected cell-based assay (Touret *et al.*, 2020). Less than 6% of the 1,520 compounds were identified as having anti-SARS-CoV-2 potency based on the *in vitro* screening for SARS-CoV-2 replication inhibition. Encouragingly, this study identified MN-166 (ibudilast) as a hit compound with potential anti-SARS-CoV-2 activity.

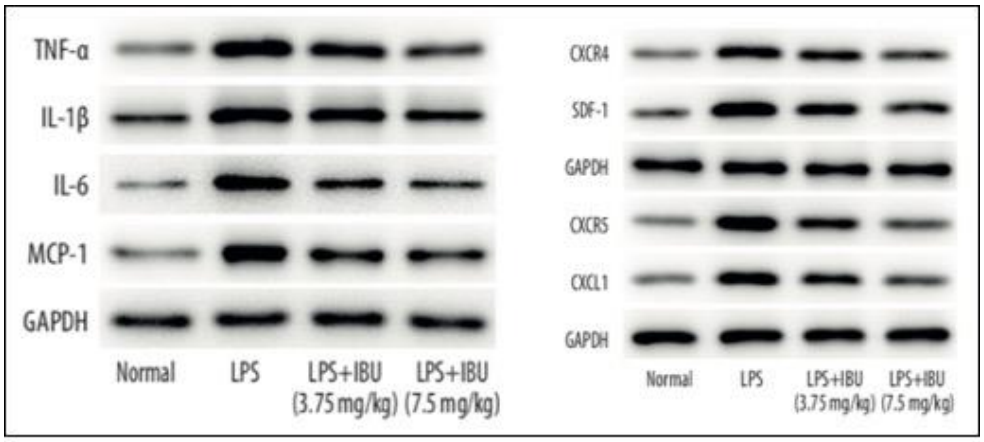
MN-166 Effective in ARDS Mouse Model

In a preclinical study, MN-166 was studied for its effectiveness on neonatal ARDS in a mouse model in which ARDS is induced with lipopolysaccharide (LPS) (Yang *et al*., 2020). Mice were divided into four groups of 10 each: a control group, a LPS-induced group, and two MN-166 treatment groups (3.75 and 7.5 mg/kg). The following figure shows that PDE4, which MN-166 is an inhibitor of, is increased by LPS stimulation and that treatment with MN-166 decreased this overexpression of PDE4 in lung tissue in ARDS mice.



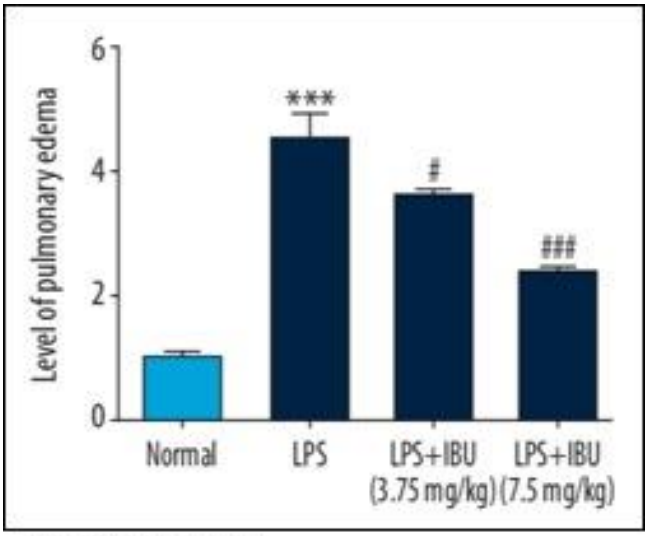
Source: Yang *et al*., 2020

In addition to decreasing the expression of PDE4, treatment with ibudilast also decreases the abnormal overexpression of different inflammatory cytokines, including TNF-a, IL-1b, IL-6, and MCP-1, and inflammatory chemokines, including CXCL1, CXCR4, and CXCR5.



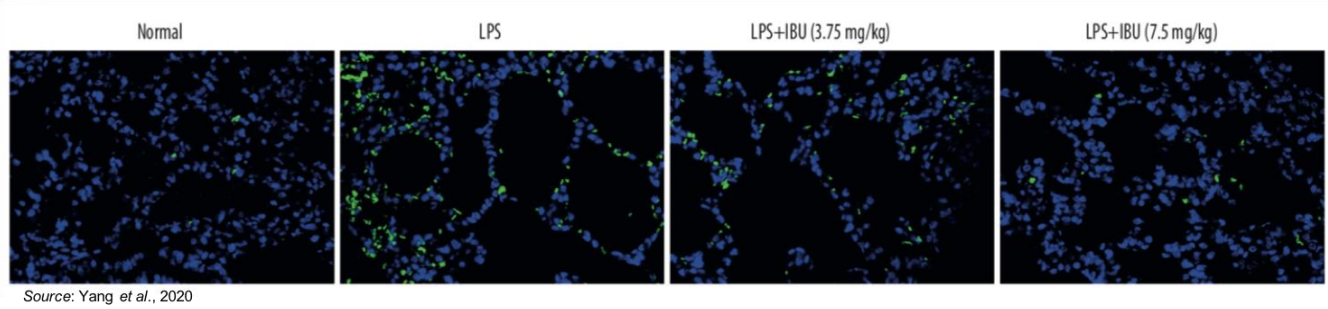
Source: Yang *et al*., 2020

Pulmonary edema was evaluated using the pulmonary edema score to indicate the amount of water accumulation in the lungs after pulmonary damage. Pulmonary edema was significantly reduced by MN-166 treatment (P<0.001). These results suggest that MN-166 may be able to reverse pulmonary edema, which is very important to the recovery of a patient suffering from ARDS.



Source: Yang *et al*., 2020

The effect of MN-166 on lung cell apoptosis was also investigated. The following figure shows a TUNEL staining assay (which measures apoptosis; indicated by bright green) in which apoptosis (cell death) is prevalent in the untreated LPS sample, however the amount of apoptosis is decreased by MN-166 treatment, thus showing the drug's ability to protect against pulmonary injury.



Source: Yang *et al*., 2020

Inhibiting MIF May Improve Outcomes in Viral Infections

MIF is a protein that exhibits cytokine, endocrine, chaperone-like, and enzyme-like properties (Stosic-Grujicic *et al*., 2009). It binds to its high-affinity cell receptor CD74, leading to recruitment of CD44 and the mediation of a number of intracellular signaling pathways, including those involving the inflammatory cascade and the innate immune response (Calandra *et al*., 2003). MIF promotes the release of pro-inflammatory cytokines, such as TNF-α, IL-6, and prostaglandin E_2. Elevated serum MIF concentrations are found in many infectious and inflammatory diseases. For example, MIF concentrations in sepsis patients correlate with disease severity (Bernhagen *et al*., 1993; Sprong *et al*., 2007) and anti-MIF antibodies protect mice in an *in vivo* model of septic shock (Calandra *et al*., 2000).

Numerous studies have shown the role of MIF in viral pathogenesis, thus potentially making MIF inhibition a suitable target for treating viral diseases, with a few of those discussed below:

- Arjona *et al*., 2007: This study investigated the role of MIF in the pathogenesis of West Nile Virus (WNV). The research showed that WNV patients had increased MIF levels in their plasma and cerebrospinal fluid. Blockade of MIF through three distinct mechanisms (antibody, small molecule, genetic deletion) increased resistance to WNV lethality in mouse models. The researchers concluded that MIF is involved in the pathogenesis of WNV and that targeting MIF could be useful in the treatment of WNV encephalitis.

- Assunção-Miranda *et al*., 2010: This study examined the involvement of MIF in dengue virus (DENV) infection and pathogenesis. Just as with WNV, patients with dengue hemorrhagic fever had elevated levels of MIF in their plasma and *mif*-deficient ($Mif^{-/-}$) mice showed less severe disease following DENV infection, including a significant delay in lethality and lower viral loads compared to wild-type mice. These results again support inhibiting MIF as a therapeutic approach to treating DENV infection.

- Regis *et al*., 2010: This study investigated the role of MIF in patients with HIV-1 infection. Those with HIV-1 infection had elevated plasma levels of MIF and the HIV-1 protein gp120 induced MIF secretion from uninfected peripheral blood mononuclear cells (PMBCs). In addition, viral replication in PBMCs declined when the cells were treated with anti-MIF antibodies while viral replication was enhanced when recombinant MIF was added to HIV-1 infected PBMCs, thus showing that MIF is involved in promoting viral activity and inhibiting MIF could lead to decreased viral activity.

- Fox *et al*., 2018: The SPRINT-MS trial in patients with progressive multiple sclerosis (MS) showed that treatment with MN-166 resulted in a statistically significant decrease in the rate of decline in brain volume along with a 26% reduction in confirmed disability progression. In addition, an analysis of adverse events during the trial showed a statistically significant difference in upper respiratory tract infections, with only 10% of MN-166 treated patients reporting an upper respiratory tract infection compared to 19% of placebo treated patients (P=0.045).

The aforementioned studies show that MIF activity is related to viral pathogenesis, and viral replication, for a wide range of viruses and thus provides adequate support for using a MIF inhibitor in the treatment of viral diseases, including COVID-19 caused by the SARS-CoV-2 virus. The data from the SPRINT-MS trial is not related to any one particular virus, but is a real-world example of how MN-166 treatment can decrease overall viral infections, adding support to the notion that inhibiting MIF with MN-166 could be useful in treating viral infections.

Conclusion

The studies outlined in this report highlight how MN-166 could be effective against COVID-19 via two different pathways. The drug has shown efficacy in its ability to decrease expression of pro-inflammatory cytokines and may also directly affect viral pathogenesis. The ability to target two separate pathways may prevent deaths and facilitate a faster recovery in COVID-19 patients and could make MN-166 a valuable weapon against the ongoing coronavirus pandemic. We have updated our model to include the use of MN-166 in preventing ARDS caused by COVID-19. The situation is very fluid right now and we anticipate peak sales estimates to change numerous times, however currently we estimate for it to be a $250 million opportunity, which has increased our valuation slightly to $25 per share.

PROJECTED FINANCIALS

MediciNova Inc.
Income Statement

MediciNova, Inc.	2019 A	Q1 A	Q2 E	Q3 E	Q4 E	2020 E	2021 E	2022 E
MN-166 (Multiple Sclerosis)	$0	$0	$0	$0	$0	$0	$0	$0
MN-166 (ALS)	$0	$0	$0	$0	$0	$0	$0	$0
MN-166 (Addiction)	$0	$0	$0	$0	$0	$0	$0	$0
MN-001 (NASH)	$0	$0	$0	$0	$0	$0	$0	$0
MN-001 (IPF)	$0	$0	$0	$0	$0	$0	$0	$0
Grants & Collaborative Revenue	$0	$0	$0	$0	$0	$0	$0	$0
Total Revenues	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Cost of Sales	$0	$0	$0	$0	$0	$0	$0	$0
Product Gross Margin	-	-	-	-	-	-	-	-
Research & Development	$6.079	$1.251	$1.800	$1.800	$1.800	$6.651	$9.000	$10.000
General & Administrative	$7.952	$1.674	$2.000	$2.200	$2.400	$8.274	$8.500	$9.000
Other Expenses	$0	$0	$0	$0	$0	$0	$0	$0
Operating Income	($14.0)	($2.9)	($3.8)	($4.0)	($4.2)	($14.9)	($17.5)	($19.0)
Operating Margin	-	-	-	-	-	-	-	-
Non-Operating Expenses (Net)	$1.1	$0.2	$0.1	$0.1	$0.1	$0.5	$0.4	$0.4
Pre-Tax Income	($12.9)	($2.7)	($3.7)	($3.9)	($4.1)	($14.4)	($17.1)	($18.6)
Income Taxes Paid	($0)	$0	$0	$0	($0)	$0	$0	$0
Tax Rate	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
Net Income	**($12.9)**	**($2.7)**	**($3.7)**	**($3.9)**	**($4.1)**	**($14.4)**	**($17.1)**	**($18.6)**
Net Margin	-	-	-	-	-	-	-	-
Reported EPS	**($0.30)**	**($0.06)**	**($0.08)**	**($0.09)**	**($0.09)**	**($0.33)**	**($0.34)**	**($0.35)**
YOY Growth	-	-	-	-	-	-	-	-
Basic Shares Outstanding	43.159	43.949	44.000	44.200	44.400	44.137	50.000	53.000

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

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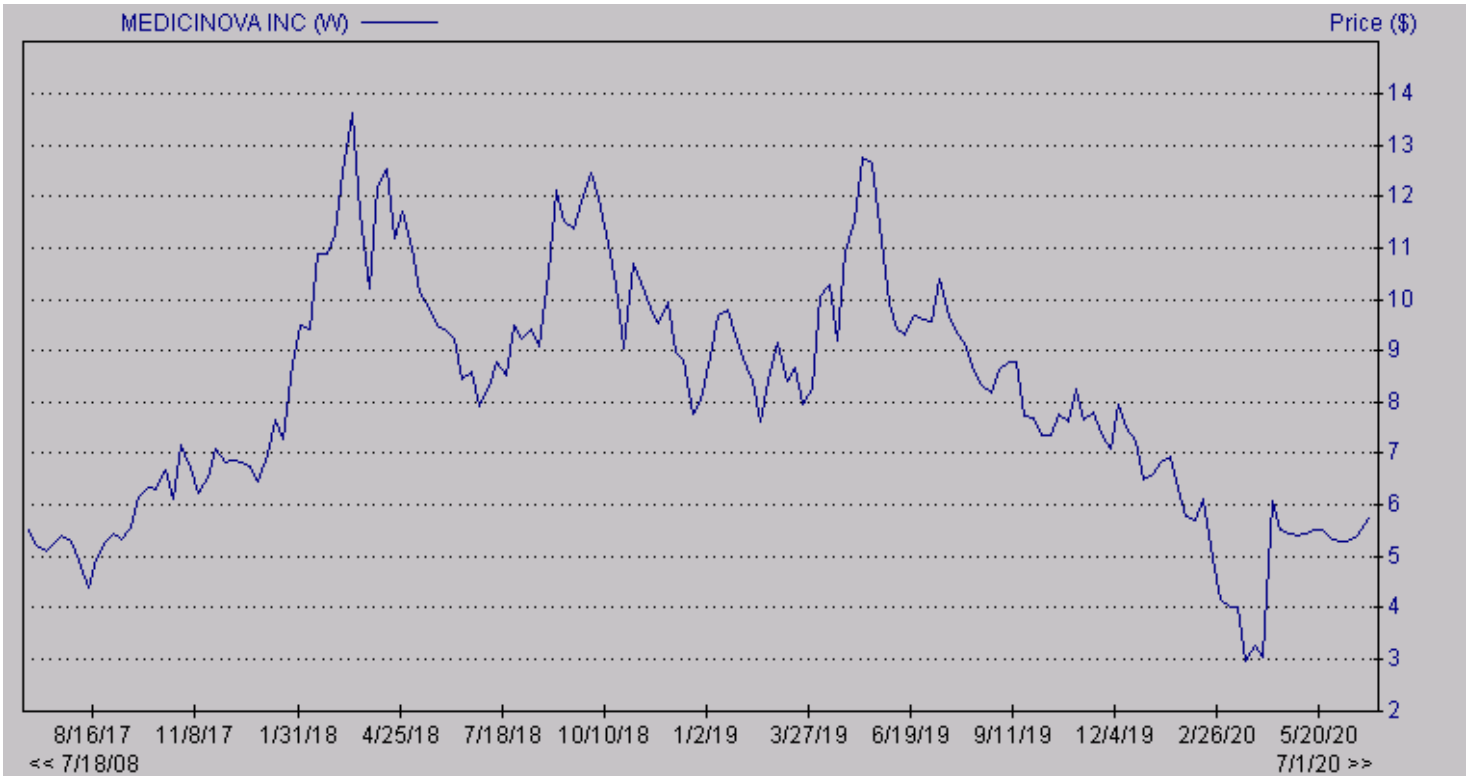
HISTORICAL STOCK PRICE



Source: Zacks Small Cap Research

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