MINERVA
NEUROSCIENCES, INC.

Corporate Presentation

May 2020

Nasdaq : NERV

Forward-Looking Statement Safe-Harbor

This presentation contains forward-looking statements about Minerva Neurosciences which are subject to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995, as amended. Forward-looking statements are statements that are not historical facts, reflect management's expectations as of the date of this presentation, and involve certain risks and uncertainties. Forward-looking statements include, but are not limited to: the benefits, efficacy and safety of our new formulations; the potential of the diagnosis and treatment of negative symptoms of schizophrenia and other diseases; whether studies performed on analogs or backups of our compounds are a good predictor of the clinical efficacy of our compounds; statements with respect to the timing and results of future clinical milestones with roluperidone (MIN-101), including the Phase 3 trial of roluperidone; statements regarding our ability to successfully develop and commercialize our therapeutic products; our expectations regarding approval for our products by the U.S. Food and Drug Administration or equivalent foreign regulatory agencies; estimates regarding the market potential for our products; and future performance. All of such statements are subject to certain risks and uncertainties, many of which are difficult to predict and generally beyond the control of the Company, that could cause actual results to differ materially from those expressed in, or implied or projected by, the forward-looking statements. These forward-looking statements are based on our current expectations and may differ materially from actual results due to a variety of factors including, without limitation, whether any of our therapeutic products will advance further in the clinical trials process and whether and when, if at all, they will receive final approval from the U.S. Food and Drug Administration or equivalent foreign regulatory agencies and for which indications; whether the results of future clinical trials of roluperidone, if any, will be consistent with the results of past clinical trials; whether roluperidone will be successfully marketed if approved; whether our therapeutic product discovery and development efforts will be successful; our ability to achieve the results contemplated by our co-development agreements; the strength and enforceability of our intellectual property rights; competition from pharmaceutical and biotechnology companies; the development of and our ability to take advantage of the market for our therapeutic products; our ability to raise additional capital to fund our operations on terms acceptable to us; and general economic conditions. These and other potential risks and uncertainties that could cause actual results to differ from the results predicted are more fully detailed under the caption "Risk Factors" in our filings with the Securities and Exchange Commission, including our Quarterly Report on Form 10-Q for the quarter ended March 31, 2019, filed with the Securities and Exchange Commission on May 4, 2020. Copies of reports filed with the SEC are posted on our website at www.minervaneurosciences.com. Our audience is cautioned not to place undue reliance on these forward-looking statements that speak only as of the date hereof, and we disclaim any obligation to update any forward-looking statements, except as required by law.

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Our Mission

We are applying the knowledge and expertise that our team has accumulated over the last 30 years working in clinical facilities and on pre-clinical and clinical research programs in the CNS field. Our aim is to develop innovative drugs that address the unmet needs of patients afflicted by neuro-psychiatric illnesses.

Our Pipeline

Program	Primary Indications	Mechanism of Action	Preclinical	Phase 1	Phase 2	Phase 3
Roluperidone **MIN-101**	Negative symptoms in schizophrenia	• 5-HT_{2A} antagonist • $Sigma_2$ antagonist • α_{1A}-adrenergic antagonist • α_{1B}-adrenergic antagonist	**Pivotal Phase 3: 515 patients enrolled – TLR Q2 '20**			
Seltorexant **MIN-202**	Primary insomnia Major depressive disorder, as adjunctive therapy	• Selective orexin-2 antagonist (SORA)	**Phase 2b (MDD2001)** Top Line Readout Q2 '19 — **completed** **Phase 2b (ISM2005)** Top Line Readout Q2 '19 — **completed** **Phase 2 (MDD2002)** Top Line Readout Q3 '19 — **completed** **FDA End of Phase 2 meeting complete**			
MIN-301	Parkinson's disease	• Neuregulin-1β1 activating ErbB4	**Pre-clinical**			

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Roluperidone (MIN-101)

Schizophrenia & Negative Symptoms

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Roluperidone (MIN-101)

- Unique mechanism of action targeting those pathways – 5HT2A, Sigma2, Alpha1A – known to be involved in schizophrenia (1)
- US Schizophrenia market is large (~ $6.0 billion) with significant opportunity for innovation to address unmet needs (2)
- Roluperidone is in development to treat patients diagnosed with schizophrenia who have negative symptoms
- Negative symptoms prevent these patients from living independent lives
- Psychiatrists cite negative symptoms as the top unmet need in the treatment of schizophrenia (3)
- No product is currently approved to treat negative symptoms in the US
- Around 800,000 Americans diagnosed with schizophrenia and living with negative symptoms could benefit from treatment with roluperidone if approved
- Recently launched branded oral schizophrenia therapies are priced around $45/day

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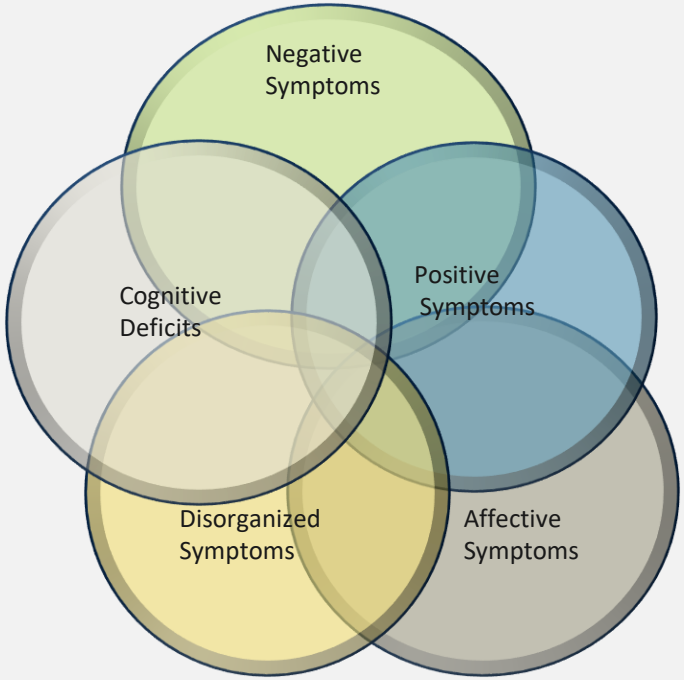
1. Girgis et al., 2018. The past and future of novel, non-dopamine-2 receptor therapeutics for schizophrenia: A critical and comprehensive review. *Journal of Psychiatry Research*.
2. IQVIA, National Prescription Audit, All Channels, Factored for Schizophrenia Use. File: IQVIA, Prescriptions, Sales and Diagnosis 2012 to 2017. Data received January 2018.
3. Schizophrenia Market Intelligence Report. Cambridge Healthcare Research. File name: Schizophrenia Intelligence 1 Dec 2017

What are negative symptoms in schizophrenia and why are they important?

- Negative symptoms cause reductions in goal-directed activity, social behavior, pleasure, and the outward expression of emotion or speech
- Negative symptoms constitute 5 main types ("The 5 As");
  - Blunted Affect
  - Anhedonia
  - Alogia
  - Asociality
  - Avolition
- Long considered a core feature of psychotic disorders1,2
- Distinct from other domains of psychopathology (e.g., psychosis, disorganization) 3
- Associated with a range of poor clinical outcomes (e.g., disease liability, quality of life, subjective well-being, recovery) 4-7

Domains of psychopathology in schizophrenia



1. Bleuler E. [Dementia praecox or the group of schizophrenias]. *Vertex* Sep-Oct 2010;21(93):394-400.
2. Kraepelin E. Dementia praecox and paraphrenia (R. M. Barclay, Trans.). New York, NY: Krieger. 1919.
3. Peralta V, Cuesta MJ. How many and which are the psychopathological dimensions in schizophrenia? Issues influencing their ascertainment. *Schizophrenia research* Apr 30 2001;49(3):269-285.
4. Fervaha G, Remington G. Validation of an abbreviated quality of life scale for schizophrenia. *Eur Neuropsychopharmacol* Sep 2013;23(9):1072-1077.
5. Piskulic D, Addington J, Cadenhead KS, et al. Negative symptoms in individuals at clinical high risk of psychosis. *Psychiatry research* Apr 30 2012;196(2-3):220-224.
6. Strauss GP, Harrow M, Grossman LS, Rosen C. Periods of recovery in deficit syndrome schizophrenia: a 20-year multi-follow-up longitudinal study. *Schizophrenia bulletin* Jul 2010;36(4):788-799.
7. Strauss GP, Sandt AR, Catalano LT, Allen DN. Negative symptoms and depression predict lower psychological well-being in individuals with schizophrenia. *Comprehensive psychiatry* Nov 2012;53(8):1137-1144.

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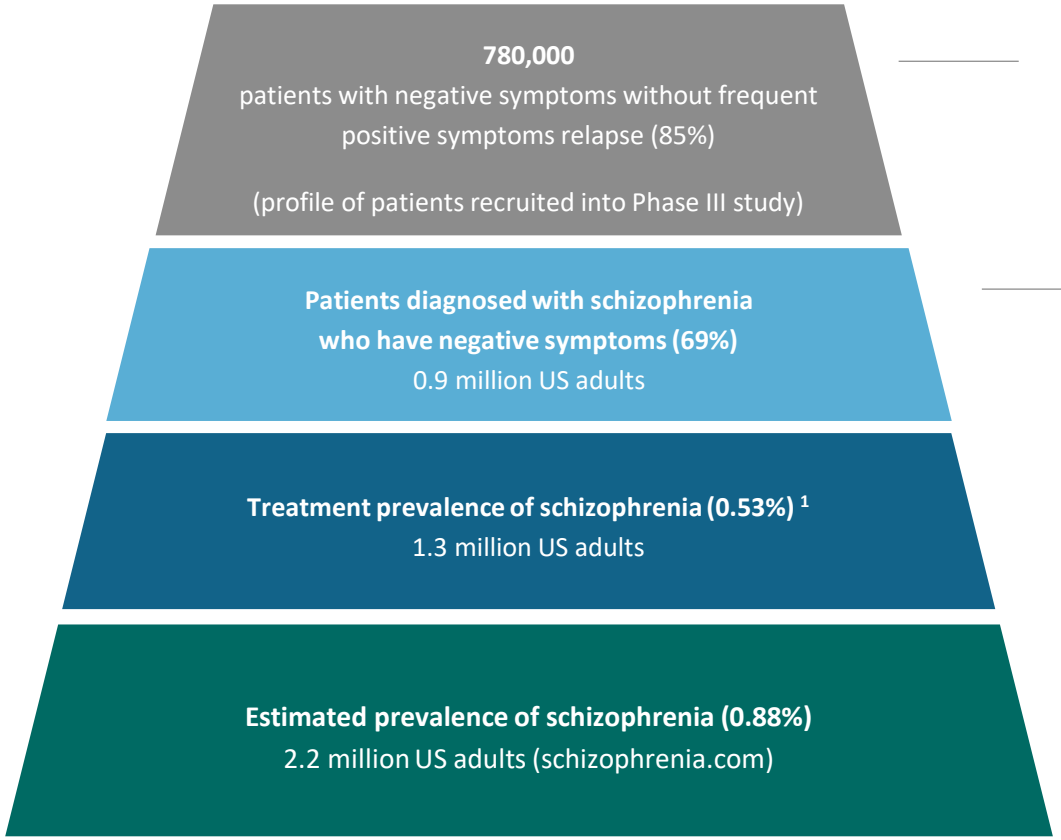
Significant commercial opportunity exists for drugs that treat the negative symptoms of schizophrenia



15%[2,3]
weighted-average 6-month relapse rate among patients with varying severity of negative symptoms

69%
of patients have negative symptoms (≈42%[2,3] predominant/ prominent symptoms & ≈27%[4] mild symptoms

1. Wu et al. Psychol Medicine. 2006;
2. Millier et al. J Market Acc Health Policy.2017;
3. Haro et al. Schizophr Research. 2015;
4. Nordstroem et al. J Social Psychiatry. 2017.

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Roluperidone (MIN-101)

Phase 3: Top Line Results Q2 2020

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Phase 3 study design

Phase 2b recap:

- The Phase 2b study demonstrated that roluperidone's effect on negative symptoms is specific (direct improvement of negative symptoms) and not a pseudo-effect (improvement of negative symptoms related to, for example, an improvement of a side-effect).
- This is the first time a specific effect on negative symptoms in schizophrenia has been demonstrated in a clinical study.
- Specificity can only be demonstrated in a monotherapy v placebo study (ref. Marder et al; ISCTM guidelines).
- Roluperidone also demonstrated effects on other schizophrenia symptoms including cognition and functioning (PSP).

Phase 3 rationale:

- The Phase 3 study is designed to confirm a specific improvement in negative symptoms (primary endpoint required for approval) and that negative symptom improvement translates into a functional improvement of the patient (key secondary endpoint.
- Patient eligibility criteria, study design, treatment duration and doses tested are largely the same as in the Phase 2b study.

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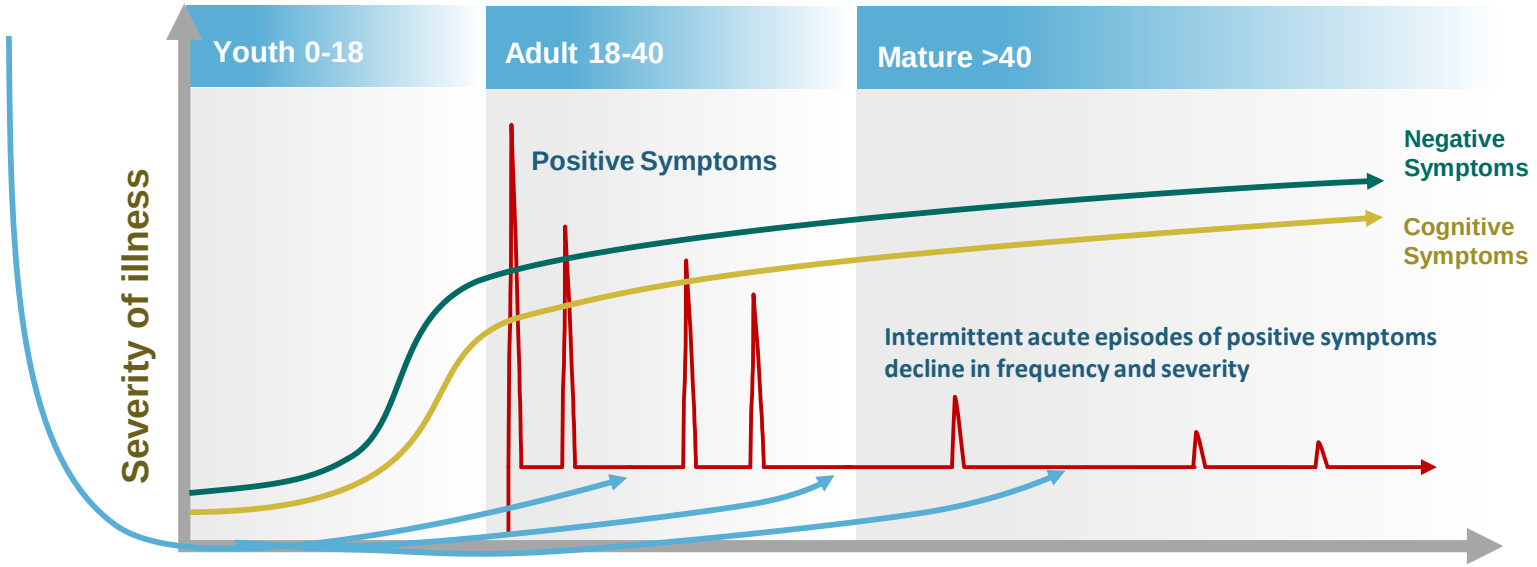
Phase 3 patient eligibility

- Male and female 18 – 55 years
- Negative Symptom (NS) stable for 6 months
- Score of NS ≥ 20pts on PANSS scale
- Positive symptom score stable for 6 months

Negative symptoms and cognitive impairment are evident at the onset of illness, before the first episode of positive symptoms, and are lifelong debilitating symptoms



All antipsychotics directly target dopamine (DA) receptors and have shown efficacy only against positive symptoms

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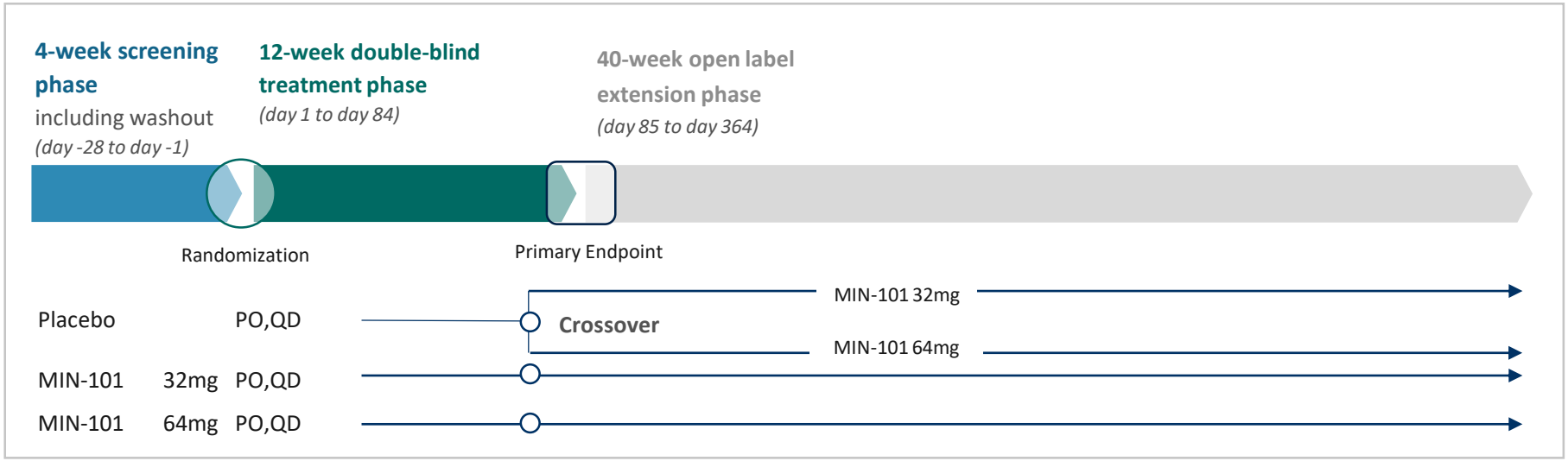
Pivotal phase 3 study design to evaluate efficacy and safety as monotherapy treatment in 501 schizophrenic patients with negative symptoms



Primary endpoint	Statistically significant reduction in PANSS Negative Symptoms Factor Score (NSFS; Marder score) from baseline after 12 weeks administration
Secondary endpoints	Personal and Social Performance scale (PSP) (key secondary endpoint), Clinical Global Impression of Severity (CGI-S)
Elective Extension	40 weeks (9 months) open-label extension with all patients on 32mg or 64 mg roluperidone
Number of patients	515 patients enrolled
Main inclusion criteria	DSM-5 schizophrenia diagnosis, Baseline score ≥ 20 on the 7 items PANSS negative score, symptomatically stable and manifesting negative symptoms for 6 months as judged by the PI, Age 18-55
Powering Assumptions	90% powered and 40% drop-out rate

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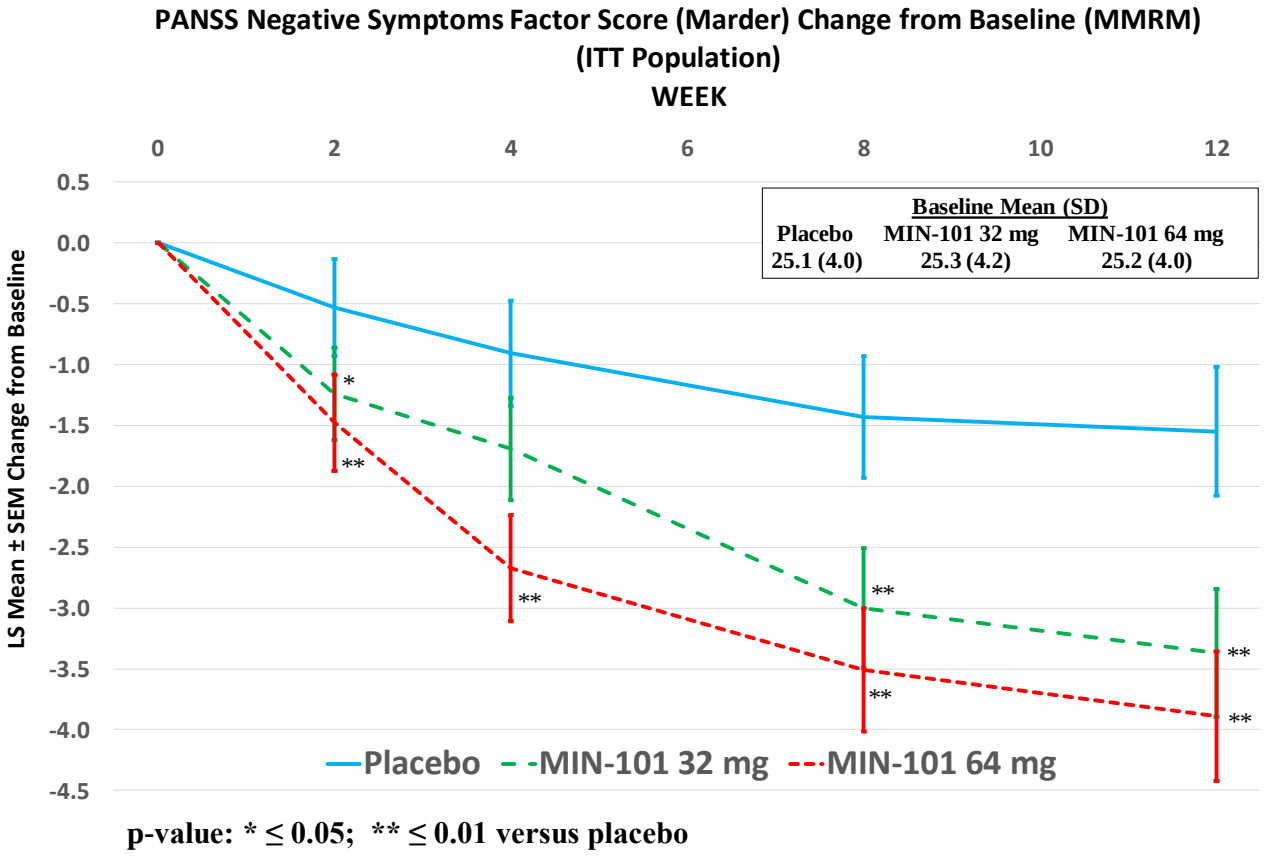
A reminder of the Phase 2b data - continuous improvement in negative symptoms score in the 12 week double blind phase

Negative symptoms Score *
(Marder score)

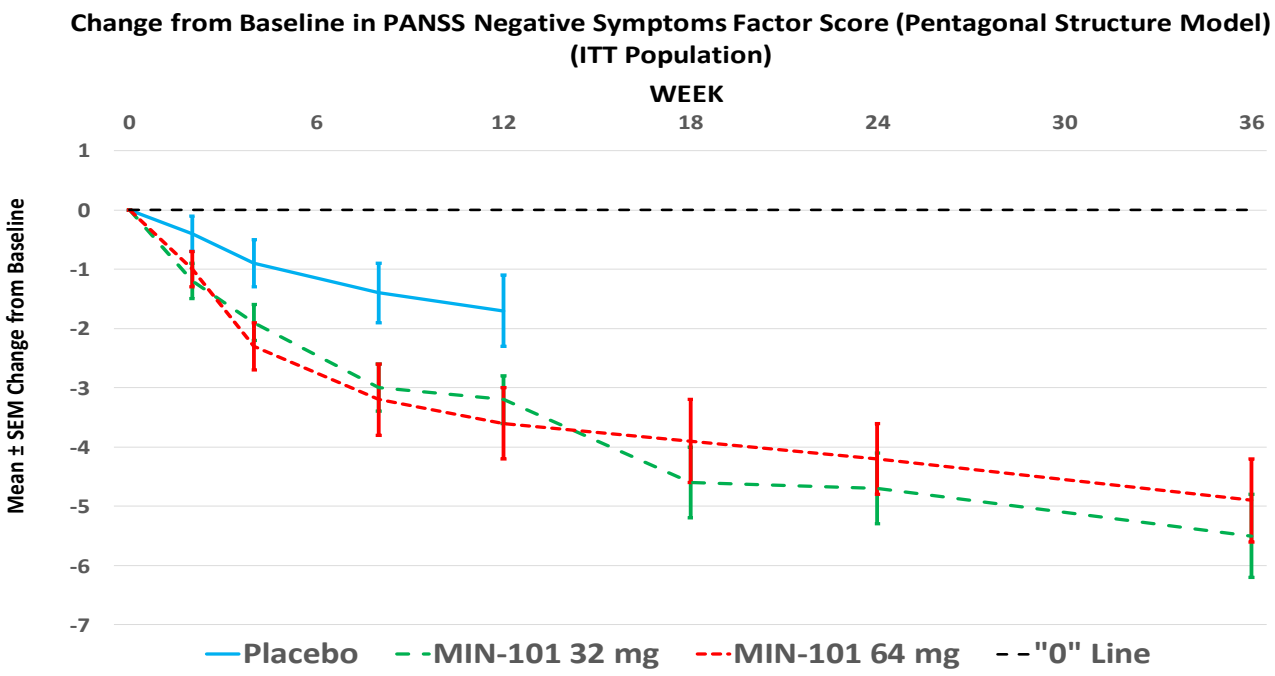


* Post-hoc analysis using Marder NS; Marder NS is the primary endpoint in the phase 3 study.

Source: Clinical Study Report, data on file.

A reminder of the Phase 2b data – negative symptoms improved over the 6 month extension (9 months treatment in total)

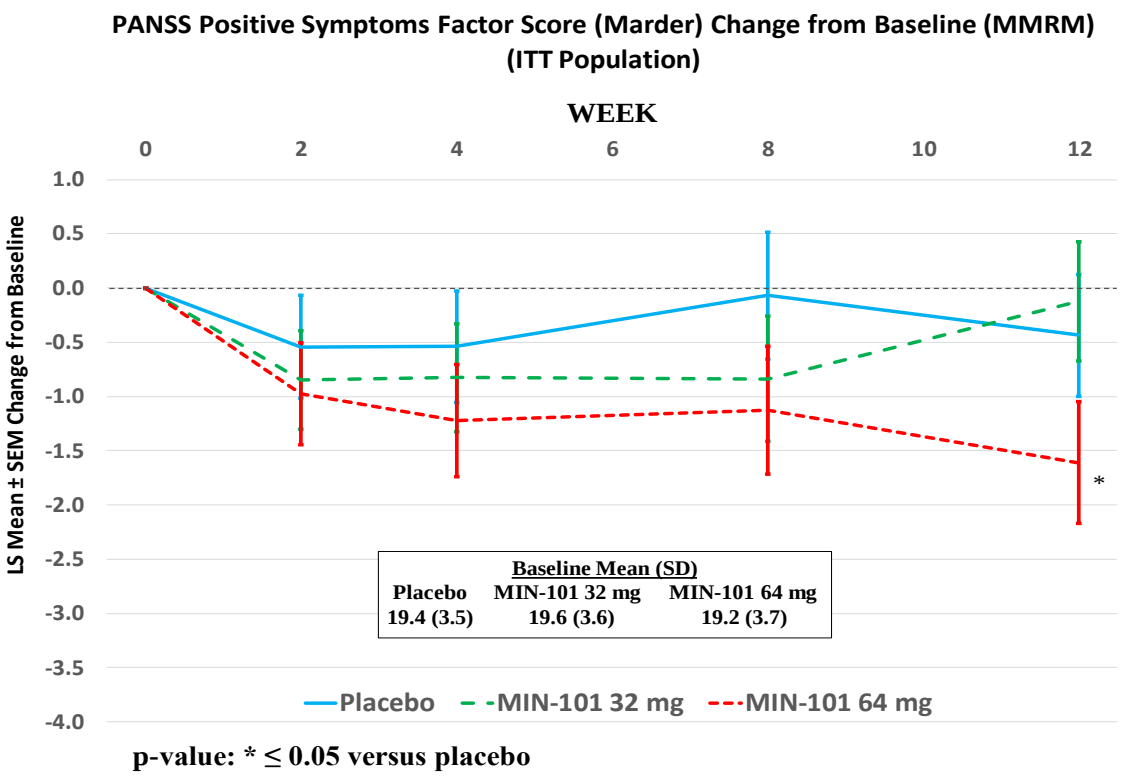
Negative symptoms Score *
(pentagonal score)



Source: Clinical Study Report, data on file.

A reminder of the Phase 2b data - improvement/maintenance of positive symptoms in the 12 weeks double blind phase

Positive symptoms Score*
(Marder score)

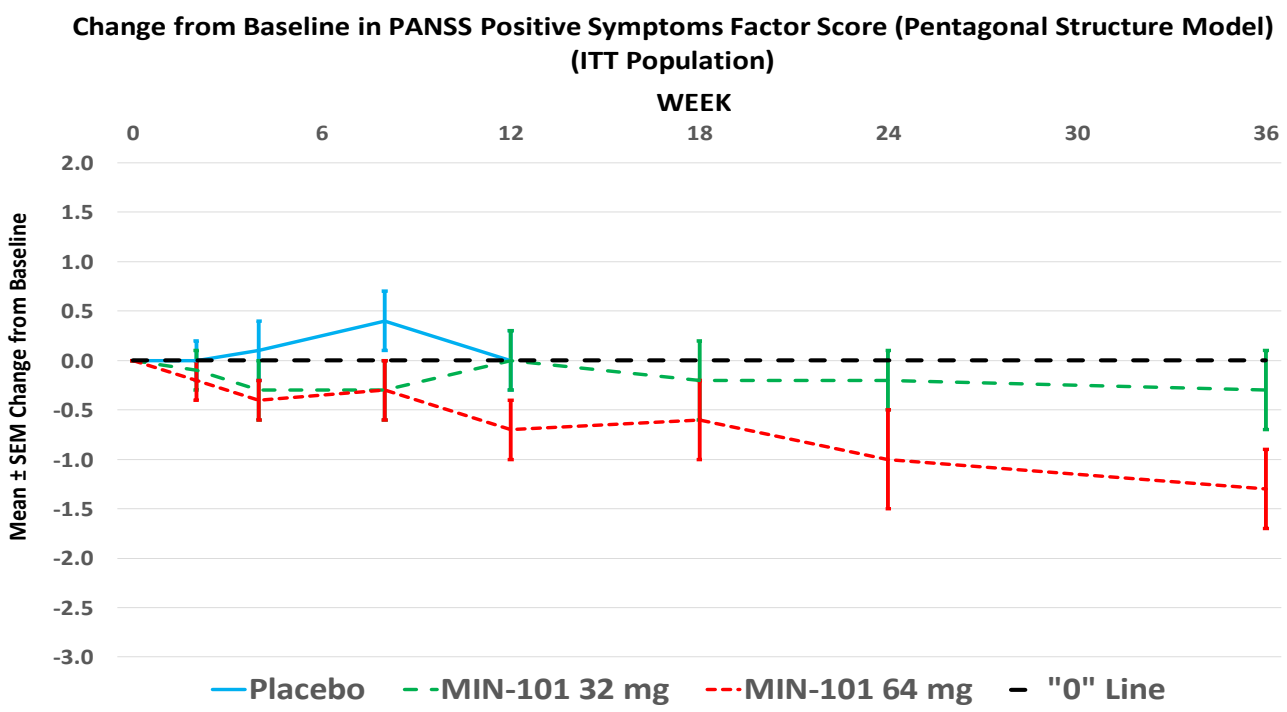


* Post-hoc analysis using Marder NS; Marder NS is the primary endpoint in the phase 3 study.

Source: Clinical Study Report, data on file.

A reminder of the Phase 2b data - continuous improvement/maintenance of positive symptoms over 6 months extension

Positive symptoms score
(Pentagonal score)



Source: Clinical Study Report, data on file.

A reminder of the Phase 2b data – statistically significant on multiple primary and secondary endpoints

Endpoint	P-Value MIN-101 versus Placebo 32 mg	P-Value MIN-101 versus Placebo 64 mg	Effect Size MIN-101 versus Placebo 32 mg	Effect Size MIN-101 versus Placebo 64 mg
Primary Objective				
PANSS Negative Subscale Score (Pentagonal Structure Model)	**0.0213**	**0.0030**	**0.45**	**0.58**
Secondary Objectives				
PANSS Total Score	0.0714	**0.0027**	**0.35**	**0.59**
PANSS Positive Subscale Score (Pentagonal Structure Model)	0.5933	0.1926	-0.10	0.25
Dysphoric Mood Subscale Score (Pentagonal Structure Model)	0.5156	**0.0238**	0.12	**0.43**
Activation Subscale Score (Pentagonal Structure Model)	**0.0213**	**0.0111**	**0.45**	**0.49**
Autistic Preoccupation Subscale Score (Pentagonal Structure Model)	0.7004	0.2586	0.08	0.22
PANSS Negative Subscale Score	**0.0058**	**0.0004**	**0.55**	**0.70**
PANSS Positive Subscale Score	0.3388	0.2832	0.18	0.21
PANSS General Psychopathology Subscale Score	0.2270	**0.0032**	**0.23**	**0.57**
Brief Negative Symptoms Scale	0.0934	**0.0044**	**0.33**	**0.56**
Clinical Global Impression of Severity	0.0964	0.0266	0.28	0.28
Clinical Global Impression of Improvement	0.2345	**0.0042**	**0.41**	**0.69**
Brief Assessment of Cognition in Schizophrenia	**0.0388**	0.5947	**0.40**	0.10
Exploratory Objectives				
Calgary Depression Scale for Schizophrenia	0.2315	**0.0090**	0.23	**0.50**
Personal and Social Performance	0.2193	**0.0021**	0.24	**0.59**

Green text indicates statistical significance and moderate or large ES

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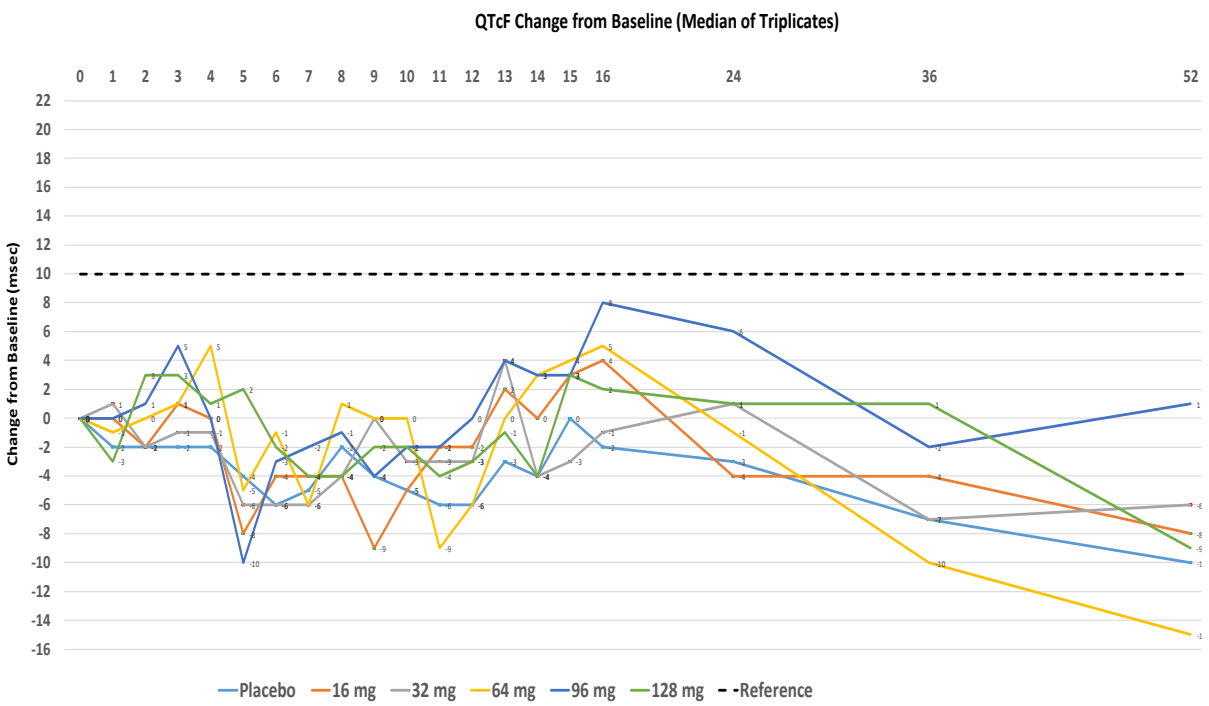
Roluperidone (MIN-101)

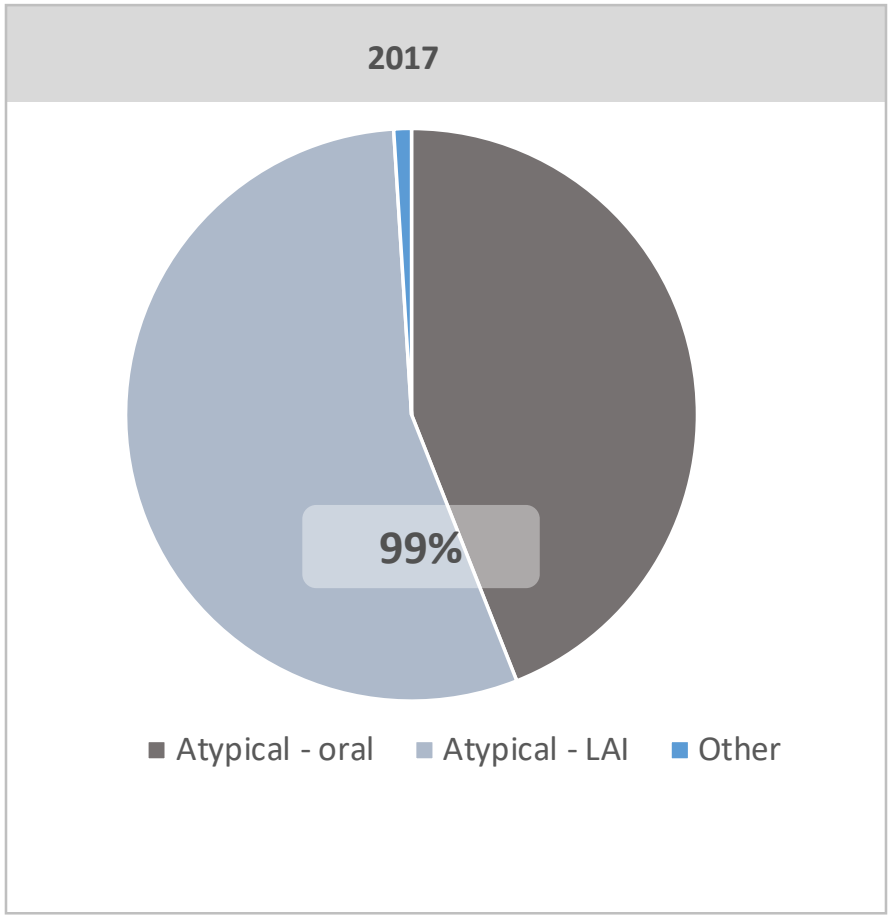
Safety profile

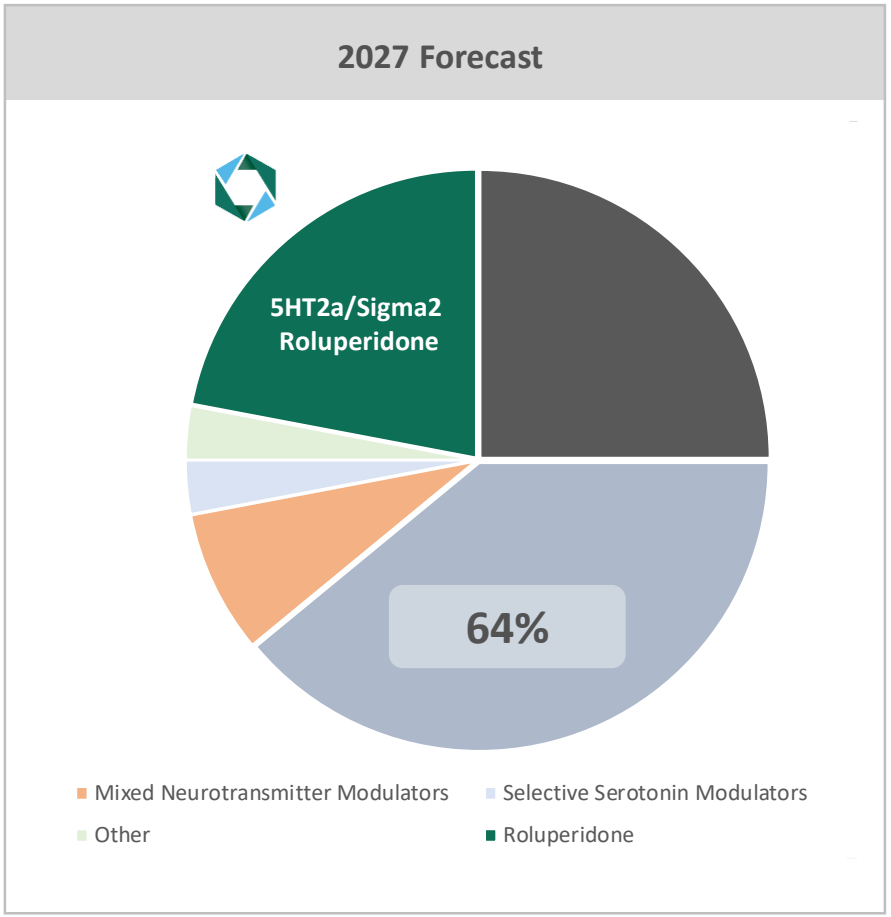
- No weight gain
- No EPS (Extra Pyramidal Symptoms)
- No prolactin increase
- No sedation
- No significant QtcF increase at 2x high dose (128mg)



Source: Clinical Study Report, data on file. A Phase I Randomized, Double-Blind, Placebo-Controlled, Single-Dose Escalation Study to Evaluate the Pharmacokinetics, ECG Pharmacodynamics, Safety, and Tolerability of MIN-101 Gastro-Resistant Modified Release Formulation in Healthy Male and Female Subjects

The changing treatment landscape for patients with schizophrenia





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Based on Schizophrenia Disease Landscape & Forecast. Decision Resources Group. Nov 2018

Roluperidone (MIN-101)

Phase 2b results have been published in several peer reviewed journals

- Overall phase 2b study results: *Davidson et al., 2017; AJP*
- Comparison of roluperidone's effects on PANSS & BNSS: *Kirkpatrick et al., 2017; Schizophrenia Research*
- Effect of roluperidone on cognition: *Keefe et al., 2017; J Clin Psychiatry*
- Effect of roluperidone on 2 dimension of the negative symptoms score: Reduced emotional experience and reduced emotional expression: *Harvey et al., 2020; Schizophrenia Research*
- Avolition: Network analysis: *Strauss et al., 2020; Schizophrenia Bulletin*

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Seltorexant (MIN-202)

Phase 2 completed

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A new approach to treating Major Depressive Disorders (MDD)

- Major Depressive Disorder, also simply known as depression, is a common mental disorder which affects more than 300 million people of all ages worldwide.

- It is a chronic condition which affects people's lives through depressed mood, feelings of hopelessness, anxiety, loss of energy and sleeping difficulties. Over 17 million adults in the US have had at least one major depressive episode in the past year. It can be life threatening and is generally accepted to be the leading cause of disability and a significant factor in workplace absence.

- Despite a large number of anti-depressant treatment options in a broad set of treatment classes, many patients fail to achieve remission, and considerable unmet needs remain, particularly in treatment-resistant major depression, onset of action and tolerability.

- Seltorexant has a unique mechanism of action amongst other drugs to treat insomnia and MDD. It is a specific Orexin-2 antagonist (SORA). Its effect on mood and its demonstrated efficacy on insomnia (latency and maintenance) represents a new approach to treating insomnia and mood disorders.

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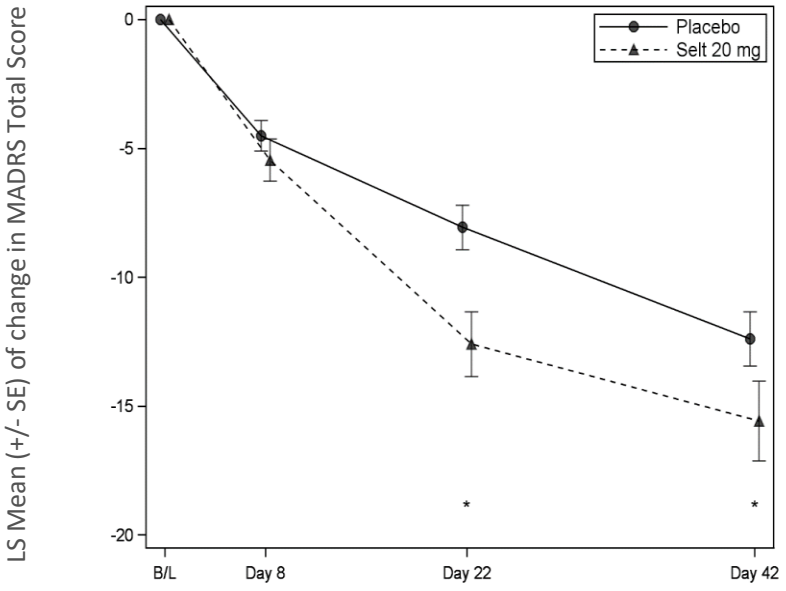
Source: Datamonitor Depression Report October 2019,

Phase 2b MDD2001 trial design and key results

First MDD trial initiated Sep 2017 (clinicaltrials.gov: NCT03227224)

- Double-blind, randomized, parallel-group, placebo-controlled adaptive dose-finding study
- 4-week screening, 6-week double-blind treatment, and 2-week follow-up
- 287 MDD patients, not responding adequately to SSRIs and SNRIs, enrolled at 84 clinical sites in the US, Europe, Russia, and Japan
  - Safety and tolerability and dose-response and efficacy for up to 3 doses of seltorexant (10mg, 20mg & 40mg)



Comparison of Selt 20mg vs. Placebo 2-sided p<0.10 : * Selt 20mg

- Seltorexant 20mg showed a statistically significant improvement in the MADRS score compared to placebo
- Improvement is more significant in patients with insomnia as compared to patients without insomnia
- Seltorexant was well tolerated with an adverse events rate similar to that of placebo

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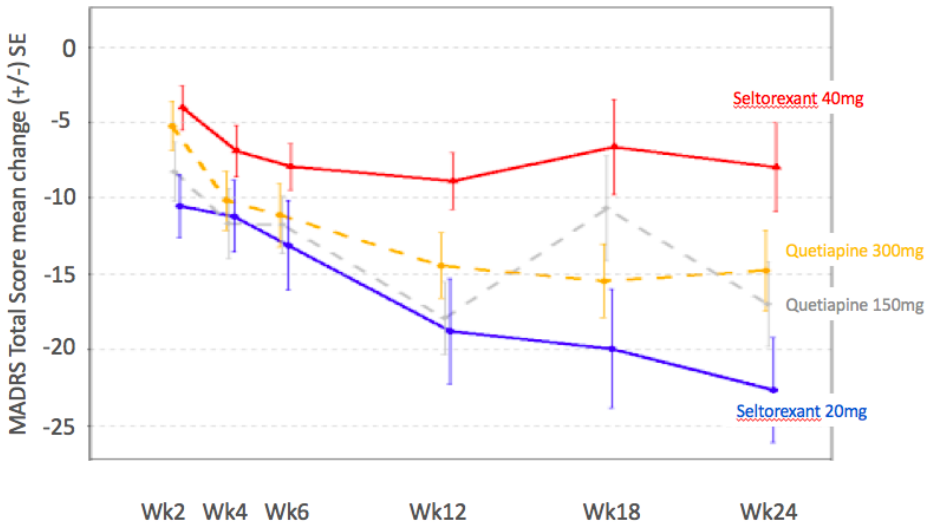
Source: Clinical Study Report, data on file.

Phase 2 MDD2002 trial design and key results

Second MDD trial initiated Dec 2017 (clinicaltrials.gov: NCT03321526)

- Double-blind, randomized, randomized, flexible-dose parallel-group study
- 4-week screening, 6-month double-blind treatment, and 2-week follow-up
- 102 MDD patients, not responding adequately to SSRIs and SNRIs, enrolled at clinical sites in the US, Europe, Russia, and Japan
  - Assess the efficacy of flexibly dosed seltorexant compared with flexibly dosed quetiapine as adjunctive therapy to baseline antidepressant therapy (either an SSRI or SNRI) in delaying time to all-cause discontinuation of study drug over a 6-month treatment period

MADRS Total Score change over time by modal dose



- 20 mg dose of seltorexant demonstrated a larger improvement at week 24 in the MADRS (-22.7 points) than patients in other groups
- As seen in the previous MDD trial (MDD2001), subjects with insomnia (Severity Index ≥15) who received the 20 mg dose of seltorexant showed greatest improvement

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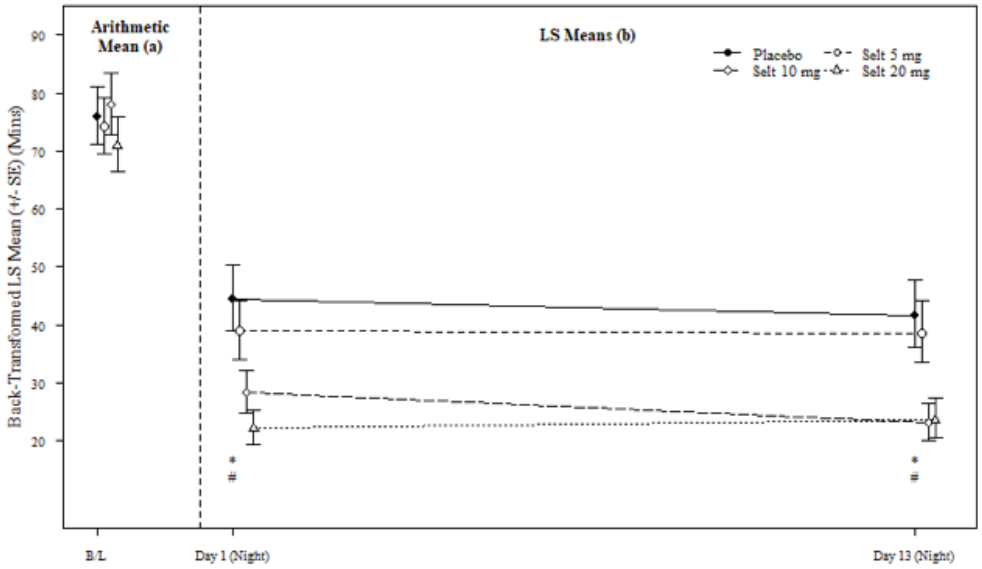
Source: Clinical Study Report, data on file.

Phase 2b ISM2005 trial design and key results

Insomnia trial initiated Dec 2017 (clinicaltrials.gov: NCT03375203)

- Double-blind, randomized, parallel-group, active- and placebo-controlled adaptive dose-finding study
- Up to 61-day duration, including screening and follow-up
- 365 patients with a diagnosis of insomnia enrolled at 56 clinical sites in the US, Europe and Japan (~70 in each group)
- Efficacy and safety analyzed in both adults and elderly subjects randomized to receive placebo, seltorexant (5 mg, 10 mg and 20 mg), and zolpidem (available under Ambien brand name)



- **Primary Endpoint LPS (latency to persistent sleep) at night 1**, with adjusted 1-sided p-values <0.001
- **Mean decreases** from baseline at Night 1 in LPS were 15 minutes for placebo, 30 minutes for seltorexant 5 mg, 43 minutes for seltorexant 10 mg, and 45 minutes for seltorexant 20 mg
- Seltorexant showed superior and more sustained efficacy compared to zolpidem
- Seltorexant showed a good safety and tolerability profile in both adult and elderly patients

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Source: Clinical Study Report, data on file.

Summary

Roluperidone: Phase 3 TLR Q2 2020	▪ Roluperidone Phase 3 enrollment completed February 2020 ▪ 515 patients enrolled ▪ 9 month extension ongoing ▪ NDA filing targeted 2021
Seltorexant	▪ Phase 2b program completed in 2019 ▪ FDA End of Phase 2 meeting complete ▪ Phase 3 design in process
Financial Position	▪ $37.6m cash balance on March 31, 2020 ▪ Cash runway to mid-2021

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Additional Information

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Roluperidone (MIN-101)

Can the mechanism of action explain observed clinical effects?

Receptor subtypes	Materials	Ki values, nmol/L
Serotonin 5-HT_{2a}	Rat, cerebral cortex Human recombinant	7.5 5.2
$Sigma_2$	Guinea pig, brain	8.2
$Sigma_1$	Guinea pig, brain	253.8
A_1 adrenergic	Rat, brain	14.4

- ✓ Specific Affinity for 5-HT_{2A}, σ_2, and α_1-adrenergic receptors
- ✓ No affinity (>1000 nM) for other receptors, including dopaminergic, muscarinic, cholinergic and histaminergic receptors
- ✓ No direct Dopamine binding
- ✓ The behavioral pharmacology package is consistent with an antagonistic effect for 5-HT_{2A}, σ_2, and α_1-adrenergic receptors
- ✓ Roluperidone increases BDNF & GDNF release

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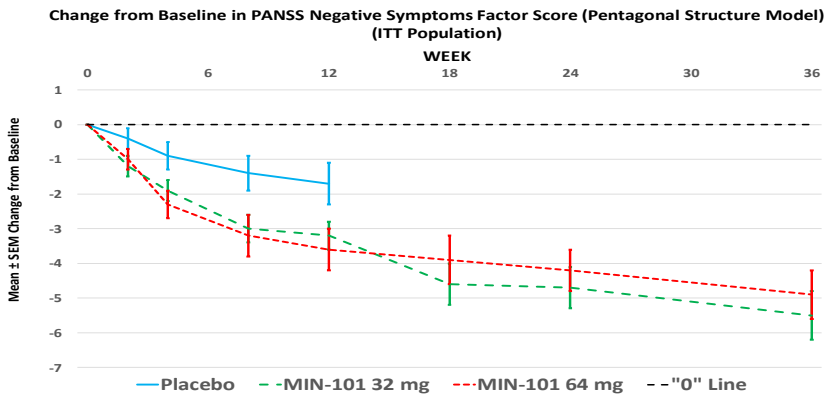
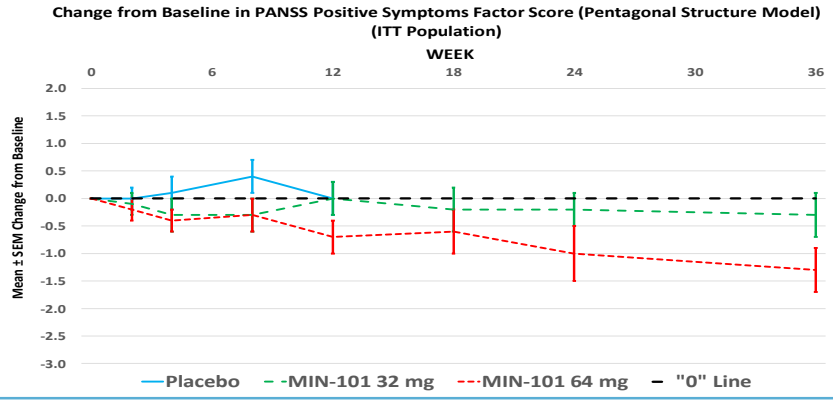
A reminder of the Phase 2b data - continuous improvement in negative symptoms over 36 weeks

Negative symptoms



Positive symptoms



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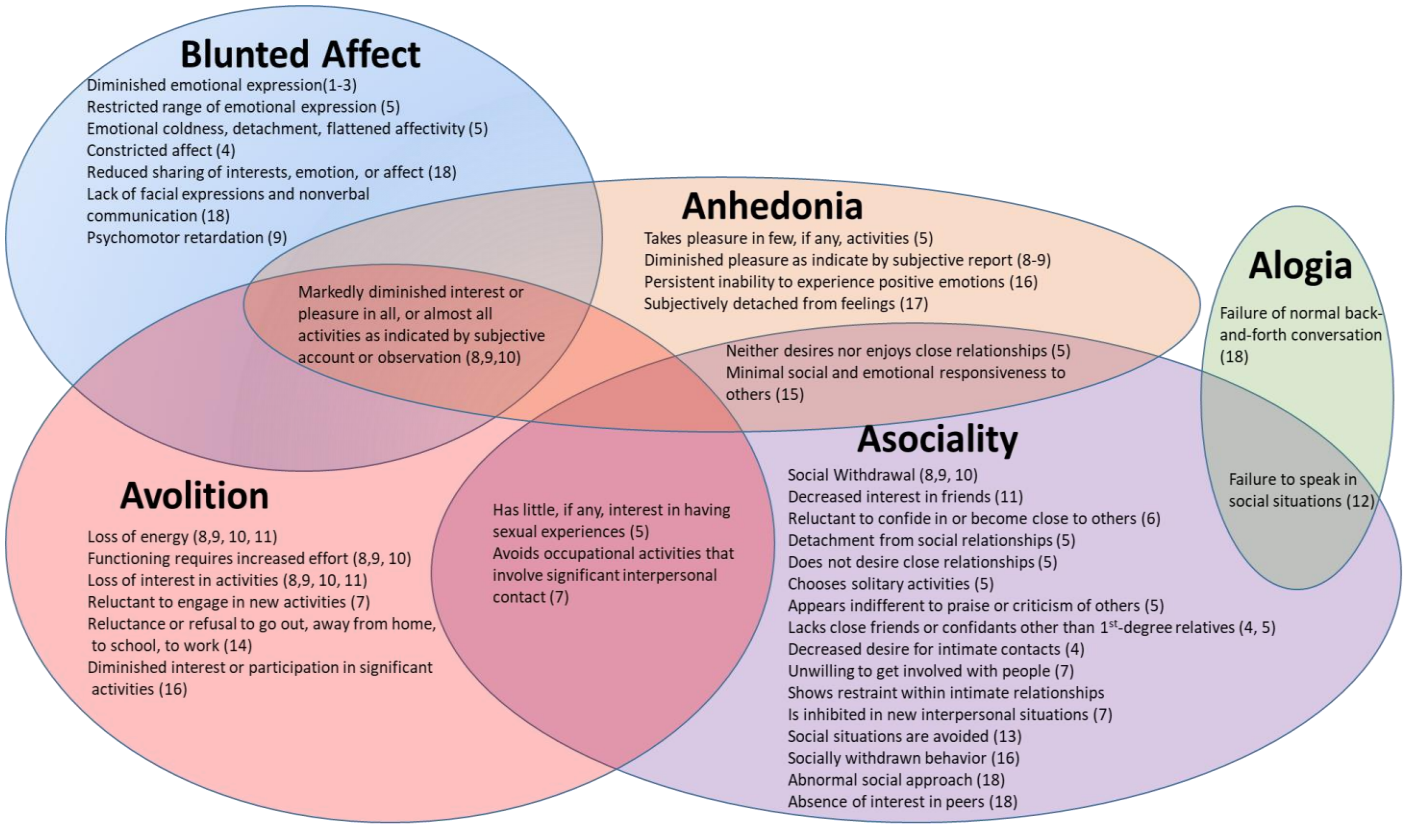
Source: Clinical Study Report, data on file.

Negative symptoms: 5 main domains & pathologies



1.Schizophrenia

2. Schizoaffective Disorder

3. Schizophreniform Disorder

4. Schizotypal Personality Disorder

5. Schizoid Personality Disorder

6. Paranoid Personality Disorder

7. Avoidant Personality Disorder

8. Bipolar Disorder (I and II)

9. Major Depressive Disorder

10. Persistent Depressive Disorder (Dysthymia)

11. Premenstrual Dysphoric Disorder

12. Selective Mutism

13. Social Anxiety Disorder

14. Separation Anxiety Disorder

15. Reactive Attachment Disorder

16. Posttraumatic Stress Disorder

17. Depersonalization/Derealization Disorder

18. Autism Spectrum Disorder

19. Neurocognitive Disorders

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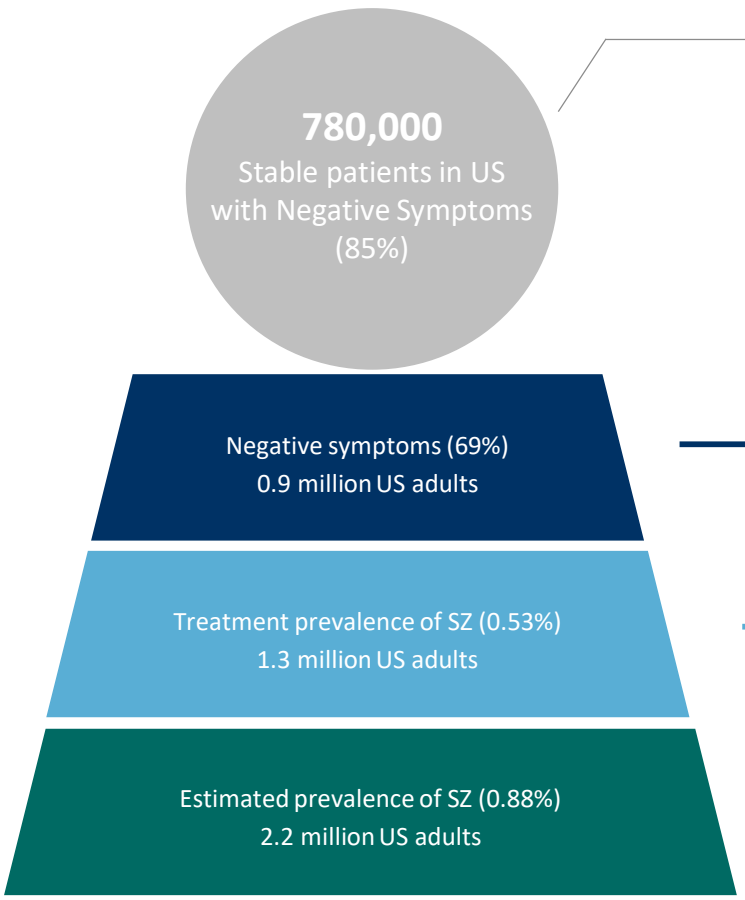
Strauss, G. P., & Cohen, A. S. (2017). A transdiagnostic review of negative symptom phenomenology and etiology. *Schizophrenia bulletin*, *43*(4), 712-719.

Significant commercial opportunity exists for treatments that address the negative symptoms of schizophrenia

Over three quarters of a million patients are potential candidates for roluperidone



Representative of the target population in the Phase 3 trial

Most recently launched branded oral Schizophrenia therapies are priced around $45/day

3% share of total prescriptions (Trx) is worth ~ $1.0 billion in annual revenue[5]

69% of patients have negative symptoms: ≈42%[2,3] predominant/prominent symptoms; ≈27%[4] mild symptoms

Prevalence of US adults with schizophrenia in treatment/yr: **0.53%**[1]

Schizophrenia.com: 2.2 million patients in US

SZ=schizophrenia.

1.Wu et al. *Psychol Medicine.* 2006; 2. Millier et al. *J Market Acc Health Policy.* 2017; 3.Haro et al. *Schizophr Research.* 2015; 4. Nordstroem et al. *J Social Psychiatry.* 2017(5).

Source: IQVIA, National Prescription Audit, All Channels, Factored for Schizophrenia Use. File: IQVIA, Prescriptions, Sales and Diagnosis 2012 to 2017. Data received January 2018.

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